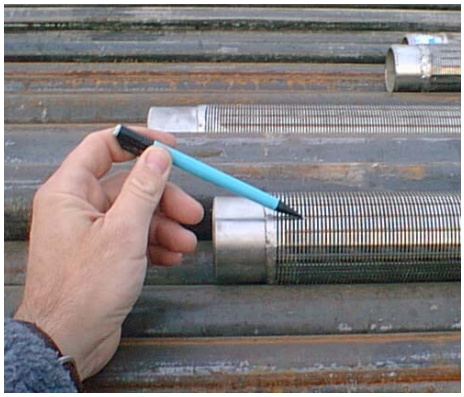

DEER CREEK WATER EXCHANGE PILOT PROGRAM

TEHAMA COUNTY PERMIT APLICATION TO EXTRACT GROUNDWATER FOR OFF PARCEL USE

February 2003

Prepared By:
Deer Creek Irrigation District

In Cooperation with
Department of Water Resources
Northern District

STATE OF CALIFORNIA
The Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Planning and Local Assistance
Northern District, Groundwater Section

DEER CREEK WATER EXCHANGE
PILOT PRORGAM
TEHAMA COUNTY PERMIT APPLICATION TO
EXTRACT GROUNDWATER FOR OFF PARCEL USE

This permit application was prepared by the Department of Water Resource, Northern District, Groundwater Section, on behalf of the Deer Creek Water District. It was prepared under the direct supervision of Toccoy Dudley, Chief of the Northern District Groundwater Section, Registered Geologist No. 3732, and was written by Dan McManus, Registered Geologist No. 272, in accordance with the provisions of the Geologist and Geophysicists Act of the State of California.

REGISTERED GEOLOGIST
Dan McManus
No. 6261
STATE OF CALIFORNIA

_____

Dan McManus
Associate Engineering Geologist
CA Registered Geologist No. 6261
CA Certified Hydrogeologist No. 272

Date: _____

DEER CREEK WATER EXCHANGE PILOT PROGRAM
APPLICATION FOR
GROUNDWATER EXTRACTION AND OFF PARCEL USE PERMIT

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FIGURES

TABLES

APPENDIX A.

APPENDIX B.

Application No. W-_____

Fee Paid _____

GROUNDWATER EXTRACTION & OFF PARCEL USE

Type of Well: New Construction [x] Existing Well [ ]
Owner's Name: Deer Creek Irrigation District
Mailing Address:

Applicant's Name: John Edson, President; Deer Creek Irrigation District
Mailing Address: Post Office Box 154
Vina, CA 96092

Site Location: NW ¼, SW ¼, Sec 4, T24N, R01W.
APN: 079-040-32

Requested Well Information:

1. Provide two copies of a scaled plot plan of the well parcel and any adjacent parcels within 2,000 feet of the well. Note locations of natural waterways, on-site sewage disposal systems, other wells (including their uses and depths, if known), structures, etc.

   - See Figure 2 in the attached report

2. Provide copies of all available reports pertaining to the construction and production of the originating well (DWR Well Driller's Report, PG&E pumping data, etc.). List the following information for the originating well and any existing well within a 2,000 feet radius of the production well.

   - See information below and Tables 1 and 2, and Figure 3 in the attached report. The proposed Test-Production well has been drilled but is in the process of pump development and testing to determine yield.

   a. Well Use: Irrigation
   b. Casing Diameter: 16-inch
   c. Total Well Depth: 940 feet.
   d. Perforation Interval: 620-840' and 880-920'.
   e. Depth of Annular Seal: 580 feet.
   f. Pump Type & Horsepower: Electric, approximately 150 horsepower motor*
   g. Depth of Pump: Approximately 250 feet*
   h. Static Groundwater Level: Approximately 100 feet below ground surface*
   i. Pumping Groundwater Level: Approximately 180 feet below ground surface*

3. a. What is the anticipated maximum draw of the groundwater in gallons per minute and gallons per-day? List the anticipated daily, weekly and monthly pumping schedule.

- We are still unsure of the optimum well yield, but we anticipated a maximum production of about 1500 gallons per minute (2,160,000 gallons per day or 6.62 acre-feet per day).

- Request is being made to pump the well for a 60 days and a maximum of 90 days between April and October. The total volume of extracted groundwater will be limited to a maximum of 750 acre-feet.

b. List the anticipated rate in gallons per minute or gallons per day, and the total seasonal volume or amount in gallons or acre-feet of water that will be used on the originating parcel.
- Anticipated pumping rate is 1500 gallons per minute. The seasonal volume will be limited to 750 acre-feet. None of the extracted groundwater will be used on the originating parcel. All of the water from the test-production well will be pumped into the Deer Creek Irrigation District canal and distributed parcels within the Deer Creek Irrigation District service area as needed for agricultural production.

c. List the anticipated rate in gallons per minute or gallons per day, and the total seasonal volume or amount in gallons or acre-feet of water that will be used on the off-parcel sites.
- Anticipated pumping rate is 1500 gallons per minute. The seasonal volume will be limited to 750 acre-feet. All of the water from the test-production well will be pumped into the Deer Creek Irrigation District canal and distributed parcels within the Deer Creek Irrigation District service area as needed for agricultural production.

4. List the existing land use and the proposed land use changes for the originating and off parcel well locations.

- The existing land and water use is outlined on pages 18-22 in the attached report. There are not expected to be any off parcel or on parcel land use changes. The groundwater will be used to irrigate existing land use within the Deer Creek Irrigation District service area.

5. Describe the general hydrology and geology of the area. Discuss the proposed use of the well in terms of specific capacity, recharge, safe yield, and radius of influence. A further specific hydrogeological study identifying the effects this proposed use would have on the affected groundwater, and the affected aquifer or aquifers may be required, including the hydraulic gradient; hydrology; percolation; permeability; piezometric surface; porosity; recharge; safe yield; salt water intrusion; specific capacity; spreading water; transmissivity; usable storage capacity; water table; and zone of saturation.

- See the *Test-Production Well* and *Existing Conditions* sections of the Attached Report.

INTRODUCTION

In cooperation with the Northern District Department of Water Resources the Deer Creek Irrigation District (DCID) is applying for a permit to extract groundwater from a test-production well for off parcel use. The groundwater extraction well is part of the Deer Creek Water Exchange Pilot Program designed to test the effectiveness of increasing the fish transportation flows in Deer Creek by seasonally substituting bypassed surface water for groundwater. A secondary element of the pilot program is to implement and test the effectiveness of newly developed guidelines for program operations and management. The guidelines, or Groundwater Management Objectives, are designed to eliminate third party impacts by combining a rigorous program of groundwater monitoring with a clear set of groundwater level and groundwater quality criteria for groundwater pumping operations. The pilot program project area is along the eastern portion of DCID in the southeastern portion of Tehama County (see Figure 1).

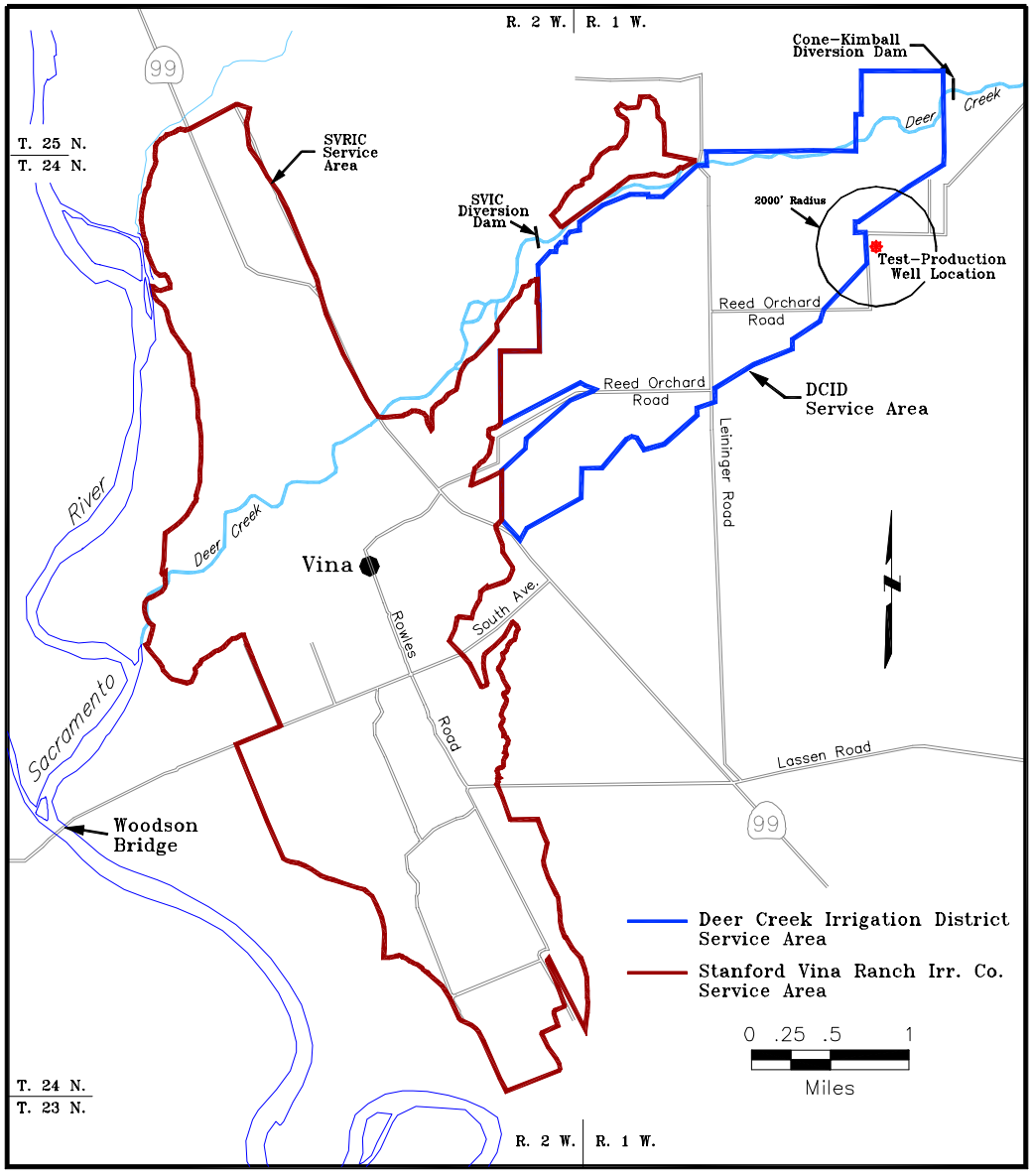


Figure 1. Project Location Map

BACKGROUND

Deer Creek Irrigation District is a political subdivision of the State of California, duly organized and existing under Division 11 of the California Water Code and providing water service for the irrigation of lands and crops and for domestic and municipal purposes within the county of Tehama.

Deer Creek represents one of the State's largest undammed watersheds and provides valuable habitat for anadromous fish, particularly the listed or threatened, spring-run, fall-run and late fall-run Chinook salmon, and steelhead trout. With over 38 miles of ideal spawning and holding habitat, Deer Creek has been identified as having the greatest potential of all Sacramento Valley streams for increasing naturally spawning populations of steelhead and spring-run Chinook salmon. Deer Creek also contributes to valuable surface water beneficial uses, including agriculture, recreation, freshwater habitat, migration, spawning and wildlife habitat.

Due in part to naturally occurring low flows and diversions by DCID and Stanford Vina Ranch Irrigation Company, the upstream migration of spring-run salmon adults or downstream migration of juvenile spring-run salmon may be impeded or blocked during April, May, June or October. In 1989, the *Upper Sacramento River Fisheries and Riparian Habitat Management Plan* concluded that the most serious impact to the Deer Creek fishery is the reduction of transportation flows. In the 1993 report, *Restoring Central Valley Streams; A Plan for Action*, CDFG assigned an A-1 priority to negotiating an agreement to obtain adequate instream transportation flow. In 1997, USFWS published the *Revised Draft Restoration Plan for the Anadromous Fish Restoration Program*. The USFWS plan prioritized reasonable actions to ensure passage of spring-run salmon in Deer Creek and assigned a *high priority* to negotiating agreements to supplement instream flows in the lower ten miles of Deer Creek. Although what constitutes sufficient flow for migration is not known, the blockage or impediments to migration can be alleviated, in part, by DCID bypassing surface water that it would otherwise divert for irrigation purposes.

In 1994, the Delta Pumps Fish Protection Agreement Advisory Committee agreed to fund the development of a Deer Creek Water Exchange Project with a goal of providing 50 cfs of supplemental transportation flow during times of critical need.

Since 1994, DWR has worked with Tehama County and DCID to study various scenarios to increase fish transportation flows in Deer Creek. In 1998 and 1999, several dedicated groundwater monitoring wells were constructed and a comprehensive groundwater monitoring program was developed. Over the last several years, continuing investigations have worked to map the local aquifer systems, determine aquifer properties and estimate possible impacts from program-related groundwater pumping. Findings from these studies indicate that a lower aquifer system exists beneath the upper aquifer system, which is currently utilized by the agricultural and domestic wells in the surrounding project area. Although these two aquifer systems are not completely separate, borehole sampling, groundwater level monitoring and aquifer testing indicates that pumping from the lower Tuscan aquifer could greatly reduce or eliminate groundwater level drawdown-related impacts to existing wells producing from the upper Tuscan aquifer.

These findings have been incorporated into the operations, management and technical design for a one-year pilot program that will test the feasibility and effectiveness of a surface water-groundwater exchange by pumping groundwater from the lower Tuscan aquifer.

The following document details the operations and management of the pilot program and outlines the surrounding existing conditions with respect to Deer Creek surface water rights and diversions, hydrology, land and water use, geology and hydrogeology.

DEER CREEK WATER EXCHANGE PILOT PROGRAM

Deer Creek Irrigation District and the Department of Water Resources are entering into an agreement to establish a one-year Deer Creek Water Exchange Pilot Program. The contract is currently being processed by the Department of Water Resources and will be finalized in March. A draft copy of the Agreement's Exhibit A (Scope of Work), Exhibit A, Attachment 1 (Groundwater Management Objectives for the Deer Creek water Exchange Pilot Program), and Exhibit B (Budget Detail and Provisions) are included in Appendix A. A generalized summary of the program is presented below.

Pilot Program Operations

The intent of the one-year pilot program is to evaluate the feasibility of a future surface water/groundwater exchange program by assessing the performance of the lower aquifer, identifying the groundwater level changes associated with pumping, and evaluating the monitoring and reporting methods associated with program operations. If findings from the pilot program indicate that an expanded program is feasible, additional work will begin to implement such a program.

Under the one-year pilot program DWR and DCID agree that a DCID shall bypass surface water that it would otherwise be entitled to divert for irrigation purposes in exchange for a like amount of groundwater pumped from the test production well. However, it is understood by both parties that the small amount of surface water bypassed during the pilot program will be difficult to gage and may not directly benefit fish passage.

During the pilot program the test-production well will be operated for a minimum of sixty days and a maximum of ninety days between April and October in accordance with the established groundwater management criteria described below and provide in Appendix A. The total volume of groundwater pumped will not exceed 750 acre-feet.

All of the groundwater extracted by the test-production well will be pumped into the Deer Creek Irrigation District distribution system to be used by DCID members within the DCID service area for beneficial agricultural use.

Test-Production Well

Drilling and construction of the test-production well was completed in January 2003. Figure 2 is a parcel map showing the location of the test-production well and all of the monitoring and non-monitoring wells within approximately one-mile. Table 1 lists the construction and groundwater information for all of the wells located within 2000 feet. Table 2 lists the construction and groundwater information for wells located within 4000 feet of the test-production well.

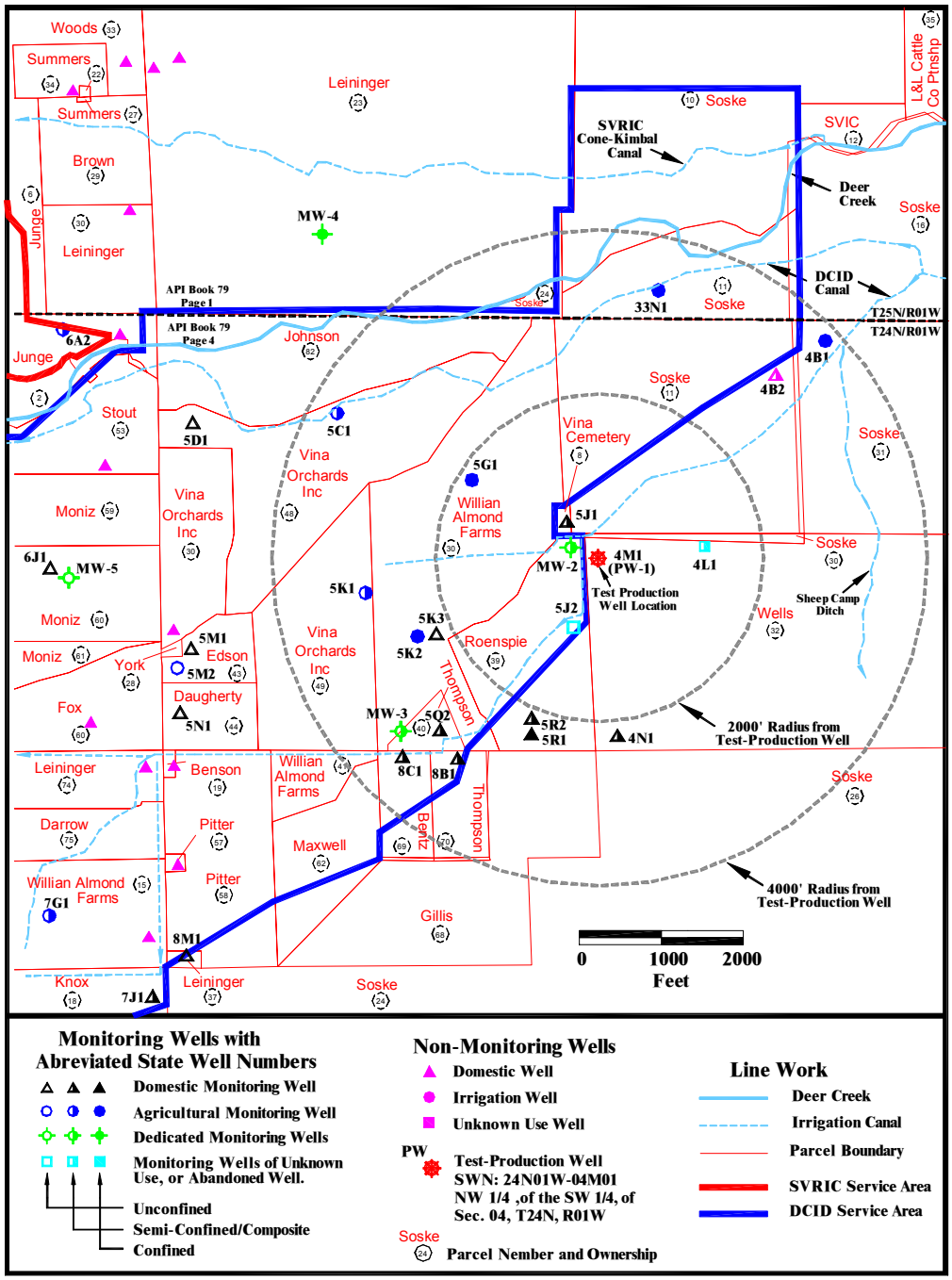


Figure 2. Parcel Map of the Test-Production Well Area.

Well Number	Distance from PW	Well Use	Casing Dia.	Total Depth	Perforation Interval	Seal Depth	Pump Type	Pump hp	Pump Depth	Static GW Level	Pumping GW Level
4M1/PW-1	0	Test-Production	16"	940'	620-920'	580'	Turbine	~150	~250'	~95'	?
MW-2 s	345	Dedicated Mont.	2"	385'	295-335'	271'	none	na	na	na	na
MW-2 d	345	Dedicated Mont.	2"	760'	650-722'	616'	none	na	na	na	na
5J1	390	Pub. (Cemetery)	8"	178'	58-178'	~20'	Sub.	?	~75'	30-35'	45-50'
5J2	850	Abandoned Dom.	8"	30'	?	none	none	na	na	~5'	na
4L1	1280	Abandoned Irr.	10"	520'	117-520'	~20'	na	na	na	95-100'	na
5G1	1823	Idle Irrigation	16"	490'	130-490'	none	Turbine	~100	150'	75-80'	~100'

Table 1. Permit Information for Wells Located within 2000 ft of the Test-Production Well.

Figure 2 and Table 1 show that there are six wells located within a 2000 foot radius of the test-production well. Of the six wells, only 5J1 is currently active. Well 5J1 is the cemetery well that draws groundwater from a perched zone in the upper Tuscan aquifer. All of the wells except 5J2 are included in the current groundwater level monitoring program.

Well Number	Distance from PW	Well Use	Casing Dia.	Total Depth	Perforation Interval	Seal Depth	Pump Type	Pump hp	Pump Depth	Static GW Level	Pumping GW Level
5R2	2120	Idle Dom/Stock	6"	160'	118-160'	~20'	Sub.	~75	~100'	75-80'	~82'
4B2	2200	Domestic	8"	230'	125-230'	20'	Sub.	?	?	~100'	~110'
5K3	2220	Domestic	8.5"	~82'	?	~20'	Sub.	?	~50'	15-20'	~30
5K2	2230	Irrigation	16"	505'	266-505'	~20'	Turbine	?	~150'	73-78'	~82'
4N1	2230	Abandoned Dom.	6"	122'	119-122'	~20'	Sub.	na	?	60-62'	na
5R1	2320	Domestic	8"	70-100'	70-100'	~20'	Sub.	?	?	55-60'	~65'
5K1	2730	Idle Irrigation	12"	260'	27-260'	~27'	none	na	na	65-70'	na
5Q2	2835	Domestic	8"	150'	60-150'	~20'	Sub.	?	~70'	43-47'	~50'
8B1	3001	Domestic	6"	150'	83-150'	~20'	Sub.	?	~70'	46-48'	~55'
MW-3 s	3200	Dedicated Mont.	2"	415'	310-330'	280'	none	na	na	85-90'	na
MW-3 d	3200	Dedicated Mont.	2"	840'	700-790'	650'	none	na	na	87-92'	na
33N	3351	Irrigation	16"	500'	180-500'	~20'	Turbine	?	?	98-100'	?
8C1	3395	Domestic	6"	160'	120-160'	20	Sub.	?	?	60-65'	~75'
5C	3650	Irrigation	8"	245'	70-245'	~20'	Turbine	~60	?	70-75'	~100'
4B	3760	Irrigation	16"	~400'	?	~20'	Turbine	?	?	110-116'	?

Table 2. Permit Information for Wells Located within 4000 ft of the Test-Production Well.

Between 2000 and 4000 feet from the test-production well there are an additional fifteen wells. Five of the fifteen wells are inactive. Figure 2 shows that all of these wells except 4B2 and 33N1 are included in the current groundwater level monitoring program. Well 33N1 was monitored from 1998 to 2002 when, due to the installation of a new pump, entry into the well was obstructed.

The design and construction of the test-production well is summarized in Table 1 and detailed in Figure 4. The test-production well is constructed with a seal down to a depth of 580 feet, to minimize or eliminate any pumping related impacts, and perforations between 620 and 920 feet, to produce exclusively from the lower Tuscan aquifer. The test-production well will be equipped with a continuous groundwater level data logger in the 2-inch sounding tube and a totalizing flow-meter on the discharge casing.

Well development and testing to determine yield will be completed by the end of February. Current estimates indicate that the well will yield between 1000 and 2000 gallons per minute or 2 to 4 cfs of groundwater in exchange for bypassed surface water. Groundwater extracted from the test-production well will flow west beneath Reed Orchard Road and discharge into the DCID's south canal.

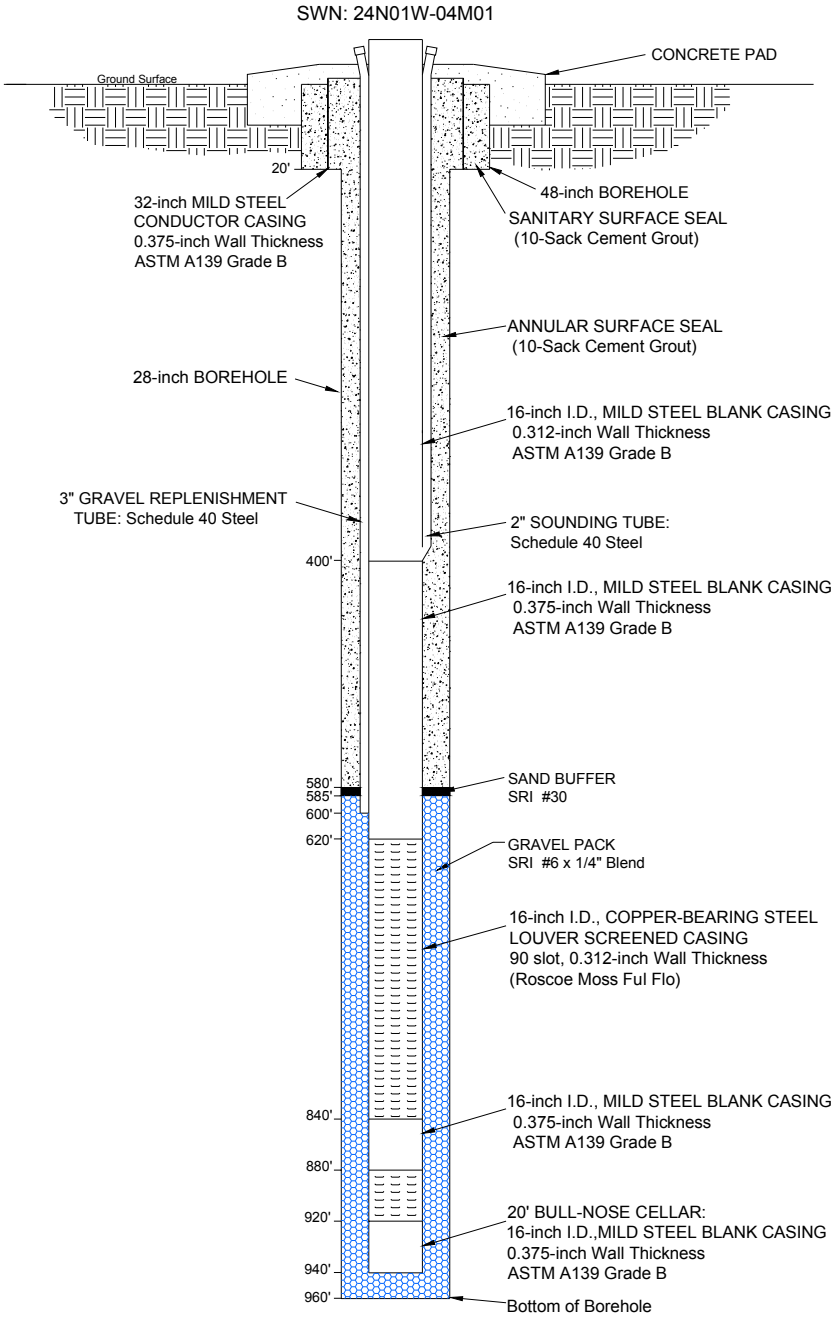


Figure 3. As-Built Design for the Pilot Program Test-Production Well.

Radius of Influence

The radius of influence of a well is dependent upon the many variables such as the water bearing properties of the aquifer, the extent, thickness and uniformity of the aquifer, the construction of the pumping well versus the observation well, the distance between the observation well and the pumping well, the rate at which the well is pumped, the length of time the well is pumped and the time of year that the well is pumped, just to name a few.

As part of the Deer Creek Water Exchange Program, aquifer performance testing and mapping of the aquifer systems have been conducted to help identify, within a relative range of accuracy,

several of these important physical parameters. However, the test-production well is still currently in the process of pump development and actual field measurements of several of the more important variables are still unavailable.

Using a conservative set of aquifer parameters from previous collected data combined with estimates of well yield and observation well construction, estimates of groundwater level drawdown in the surrounding irrigation and domestic wells due test-production well pumping were calculated for pumping periods of 30 and 60 days using the WTAQ2 program for partially penetrating wells in water-table aquifer. Sixty days is the estimated to be the maximum period of continuous test-production well pumping. The two radius-of-influence scenarios are shown below in Figures 4 and 5.

In scenarios illustrated in Figures 4 and 5, domestic wells were assumed to be constructed to a depth of 150 feet, with the perforation interval between 80 and 150 feet. Irrigation wells were assumed to be constructed to a depth of 500 feet, with the perforation interval between 80 and 500 feet. The test-production well was conservatively assumed to be producing from the lower Tuscan aquifer at a depth of 500 to 900 feet. Conservative estimates of the physical aquifer parameters were selected and are listed in the graphs.

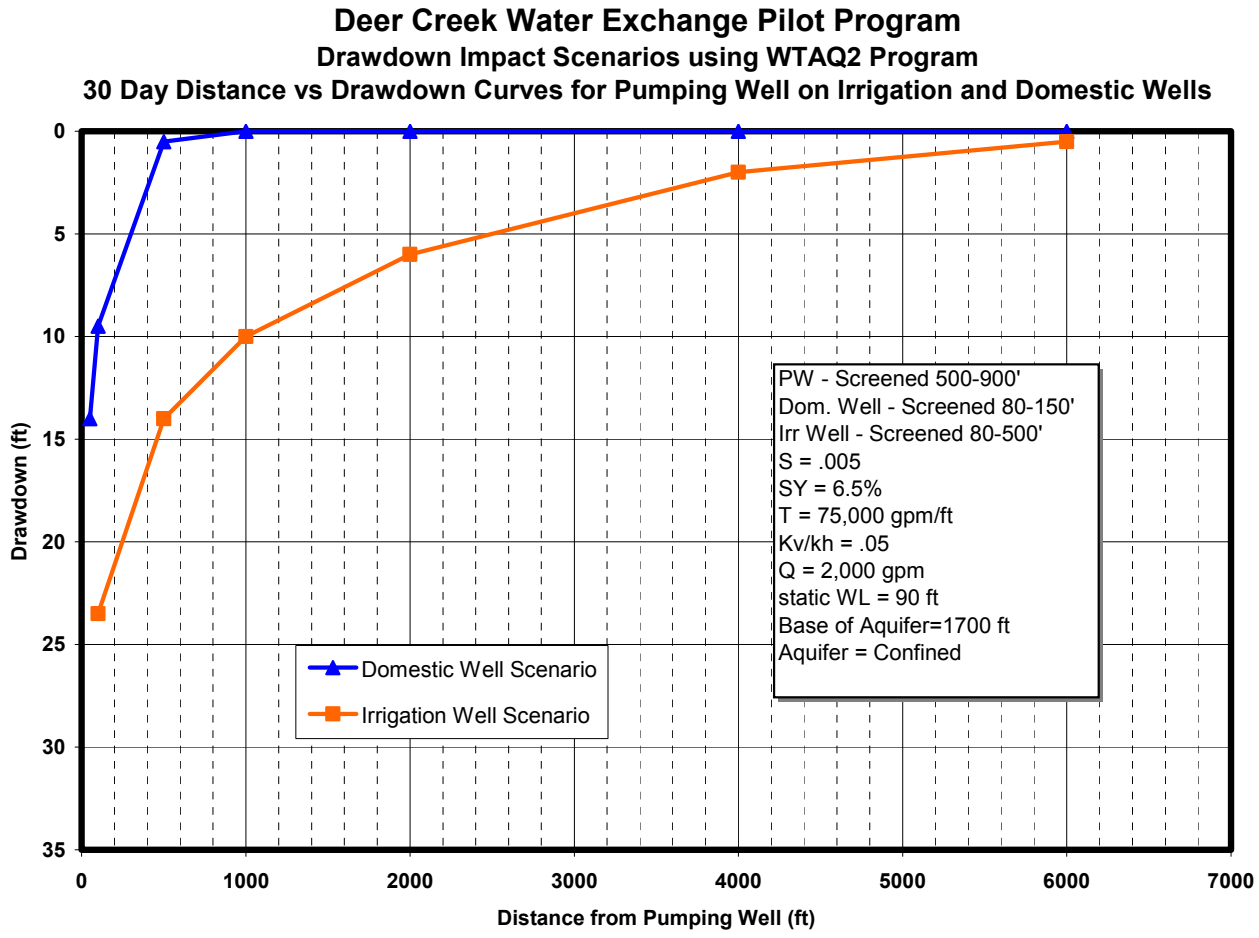


Figure 4. Estimated 30-Day Distance-Drawdown Curves for Irrigation and Domestic wells.

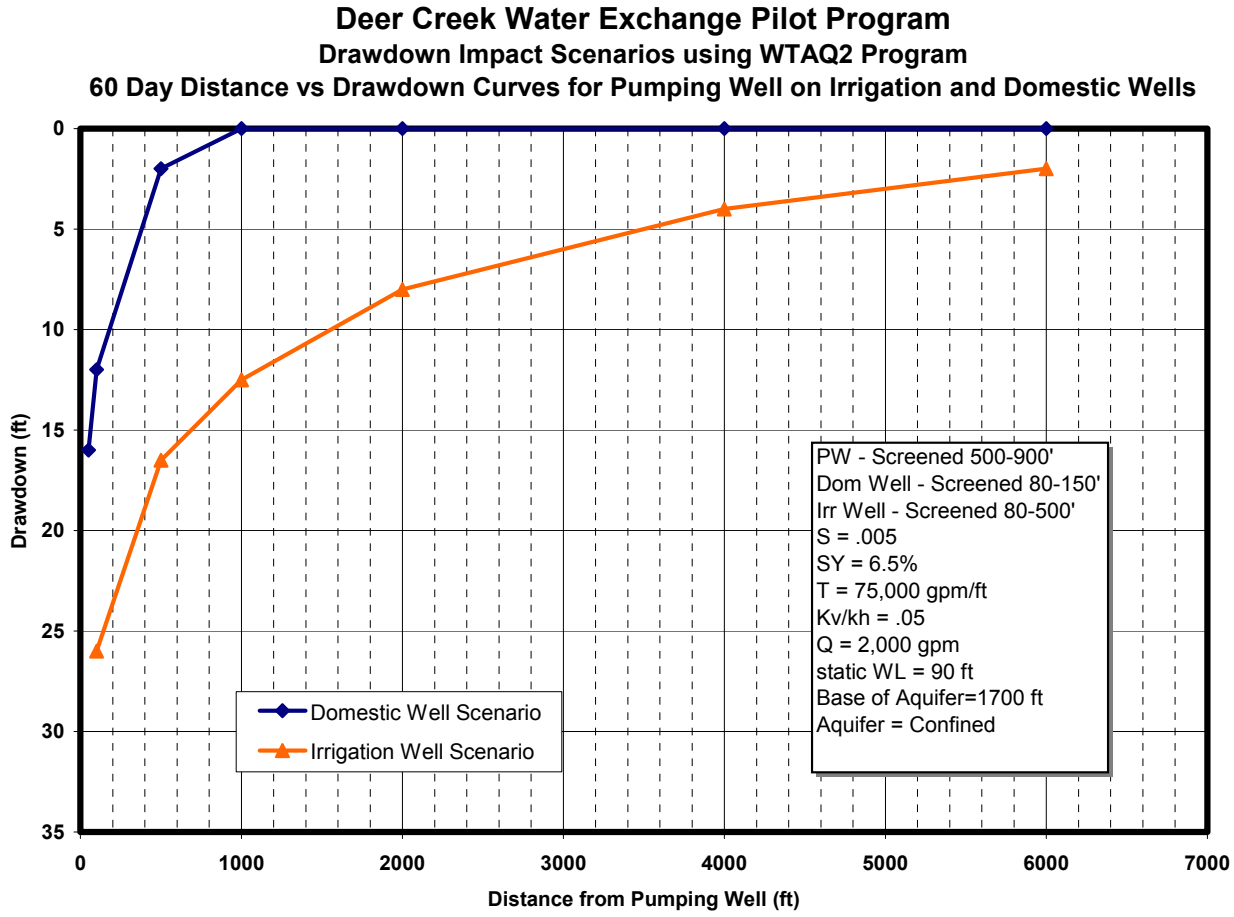


Figure 5. Estimated 60-Day Distance-Drawdown Curves for Irrigation and Domestic wells.

The only active well within 2000 feet of the test-production well is 5J1, the cemetery well. Well 5J1 is approximately 400 feet from the test-production well. Estimated drawdown in 5J1 would follow the curve representing domestic well construction. Based on the calculated estimates from the WTAQ2 program, Figures 4 and 5 indicate that the cemetery well would experience a 30 and 60 day drawdown of 3 and 5 feet respectively. All other surrounding domestic wells are located at distance greater than 1000 feet from the test-production well. At distances of a 1000 feet or greater, the estimated drawdown impact to domestic wells is zero.

The nearest active agricultural well is 5K2. Well 5K2 is located about 2200 feet from the test-production well. Estimated drawdown in 5K2 would follow the curve representing irrigation well construction. Based on the calculated estimates from the WTAQ2 program, Figures 4 and 5 indicate that the 5K2 would experience a 30 and 60 day drawdown of 6 and 8 feet respectively. The next closest active irrigation well is 33N1. Well 33N1 is located about 3300 feet from the test-production well. At this distance, the impact to 33N1 is estimated at 3 to 6 feet.

Although drawdown related impacts were conservatively calculated using the best data available, there are limitations to all methods of modeling. In order to further ensure no impacts to the surrounding groundwater users, an extensive monitoring and reporting program has been developed and tied to the operations and management of the pilot program. Details of the monitoring program are summarized below and detailed in Appendix A (Exhibit A, Attachment 1).

Pilot Program Monitoring

Monitoring of the surface water and groundwater systems is a key component of the pilot program operations and management. The goal of the monitoring program is to maintain the groundwater elevation at a level that will assure an adequate and affordable irrigation water supply, and to assure a sustainable supply of good quality water for agricultural and domestic use. A brief overview of the monitoring program is listed below. A detailed explanation of the monitoring program and management procedures are provided in Appendix A (Exhibit A, Attachment 1). .

Surface Water Monitoring:
Surface water systems will be monitored for flow and water quality. Figure 4 shows the lower Deer Creek drainage and the surface water distribution system for DCID. Prior to the diversion of Deer Creek waters by DCID, Deer Creek flows will be monitored at the USGS gaging station (No. 11383500; *Deer Creek Near Vina*). The USGS collects discharge, gage height and water temperature data at the Deer Creek gage. Real time access of this data is available at: http://waterdata.usgs.gov/ca/nwis/uv?11383500. Downstream from the USGS gage, diversion of Deer Creek waters by DCID will be continuously monitored and recorded by DWR using an engineered 8-foot parshall flume located just below the main diversion (see Figure 6).

Surface water quality will be monitored as per the criteria listed in the Appendix A (Exhibit A, Attachment 1). The Department of Water Resources will be responsible for field collection and testing of the surface water quality samples. Analytical testing will be conducted at a State of California approved laboratory and will include analysis for minerals, trace metals and nutrients. Surface water samples will be collected in the DCID canal above and below the point where the test-production well discharges into the canal. Water quality monitoring will be conducted once prior to the start of the pilot program operations, once within 5 days after the start of the pilot program, once every 30 days of continuous pumping, and once at the conclusion of the program.

The Department of Water Resources will evaluate the surface water quality data for compliance with the maximum contaminant limits (MCL's) for agricultural water established by the Food and Agricultural Organization of the United Nations.

Groundwater Monitoring:
One of the key criteria for program operations is maintaining a predetermined range of acceptable groundwater levels surrounding the test-production well and a minimum quality of groundwater extracted from the test-production well. In order to accomplish these objectives a groundwater monitoring network was developed and "key" monitoring wells were used to help evaluate compliance with the groundwater level criteria. Figure 7 shows the regional groundwater monitoring grid for the project area and Figure 8 shows the localized grid with Key Monitoring Wells. A full explanation of the groundwater level and groundwater quality monitoring program is provided in Appendix A (Exhibit A, Attachment 1).

The Department of Water Resources will be responsible for monitoring groundwater levels during the pilot program. The monitoring frequency will vary depending upon monitoring well location and type, and the program operation schedule. During pilot program operations, the depth to groundwater will be measured in the Deer Creek monitoring wells, east of Highway 99, at a minimum frequency of two times per month between April and October, and monthly from November through March. In addition, the seven Key Wells and the remaining dedicated

monitoring wells within the Deer Creek monitoring grid will be equipped with automated groundwater level recording equipment. The automated equipment will be set to measure groundwater levels at a minimum frequency of twelve times per day. The data from this equipment will be downloaded two times per month between April and October, and monthly from November through March.

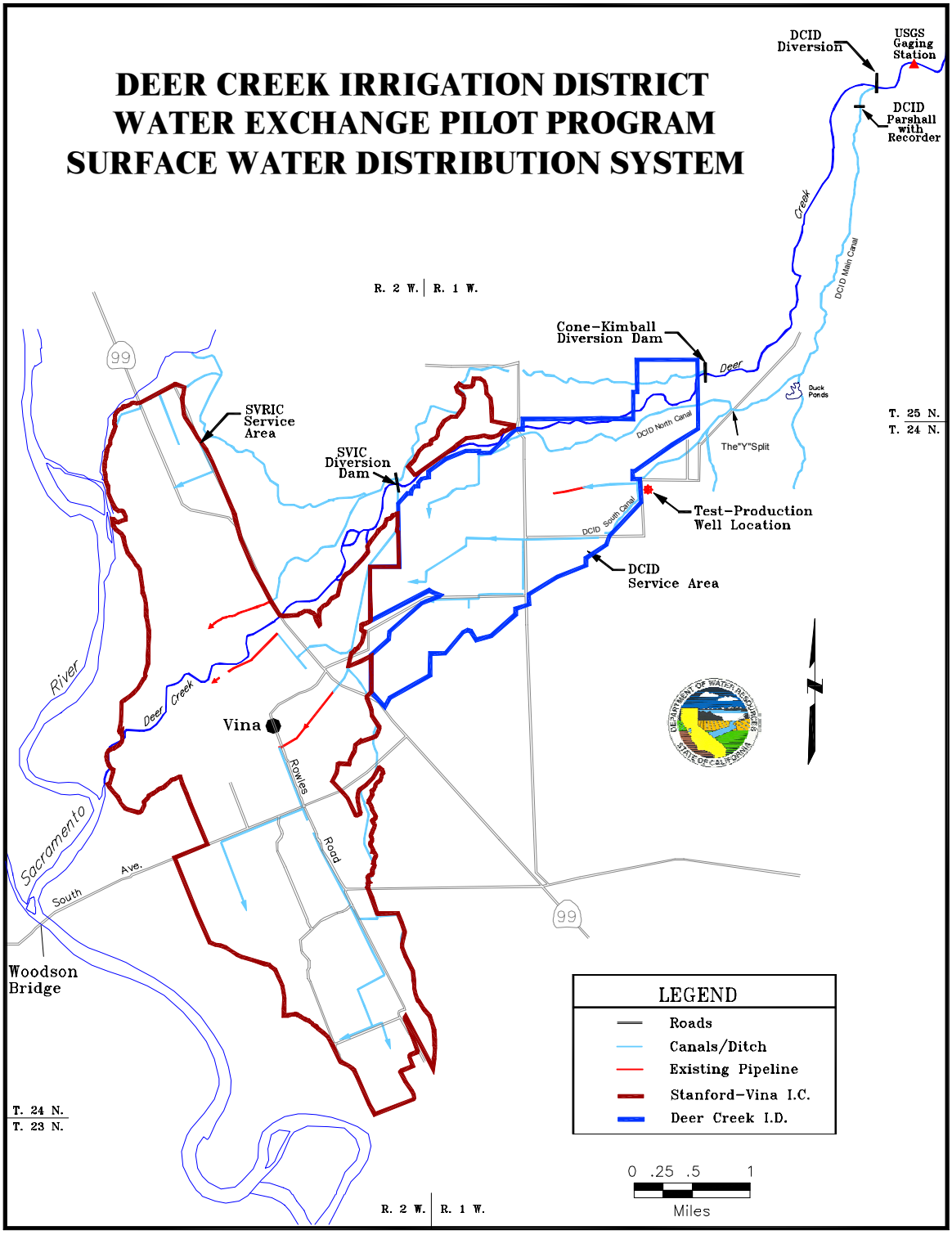


Figure 6. DCID Surface Water Distribution System.

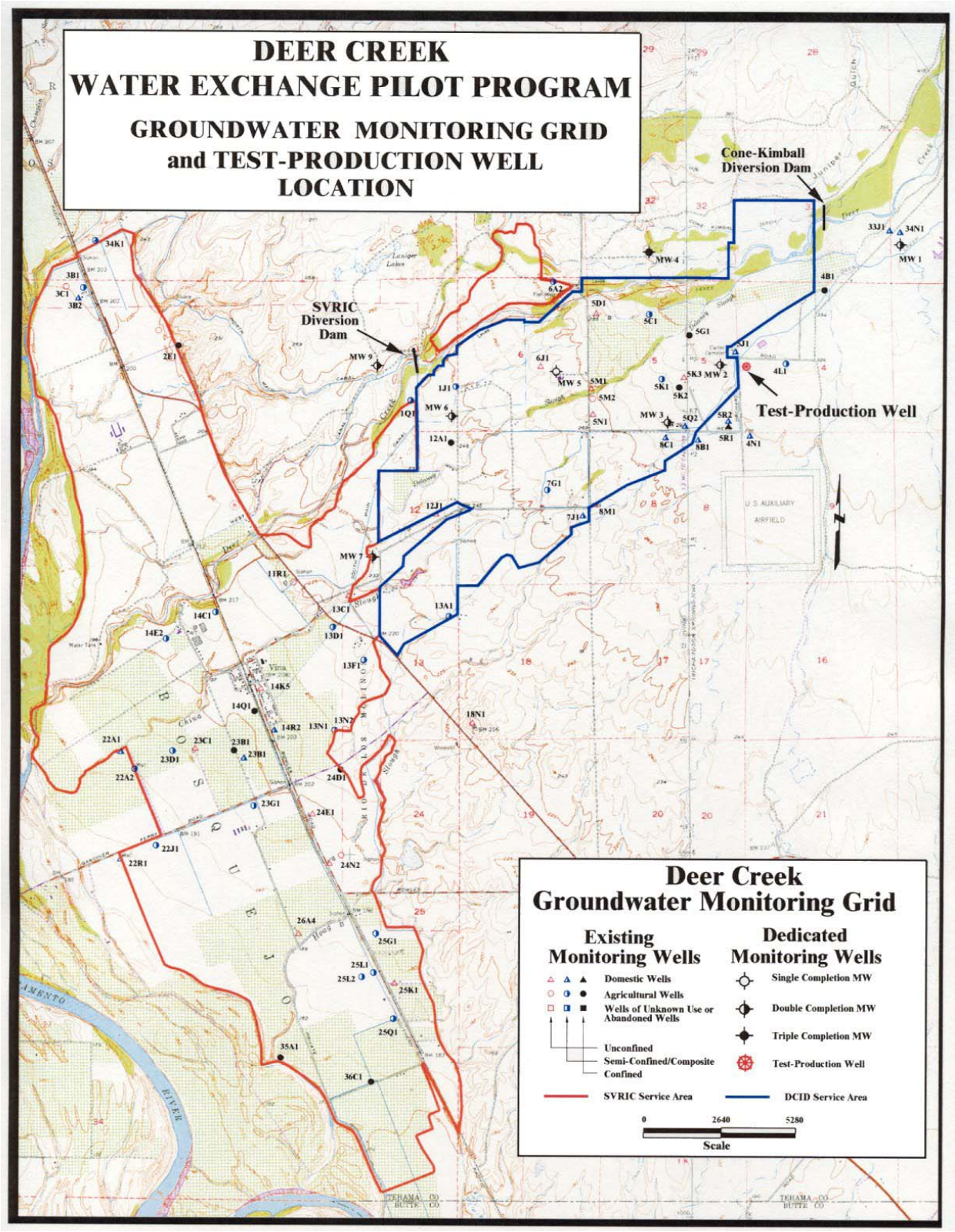


Figure 7. Regional Groundwater Monitoring Grid for the Deer Creek Water Exchange Pilot Program.

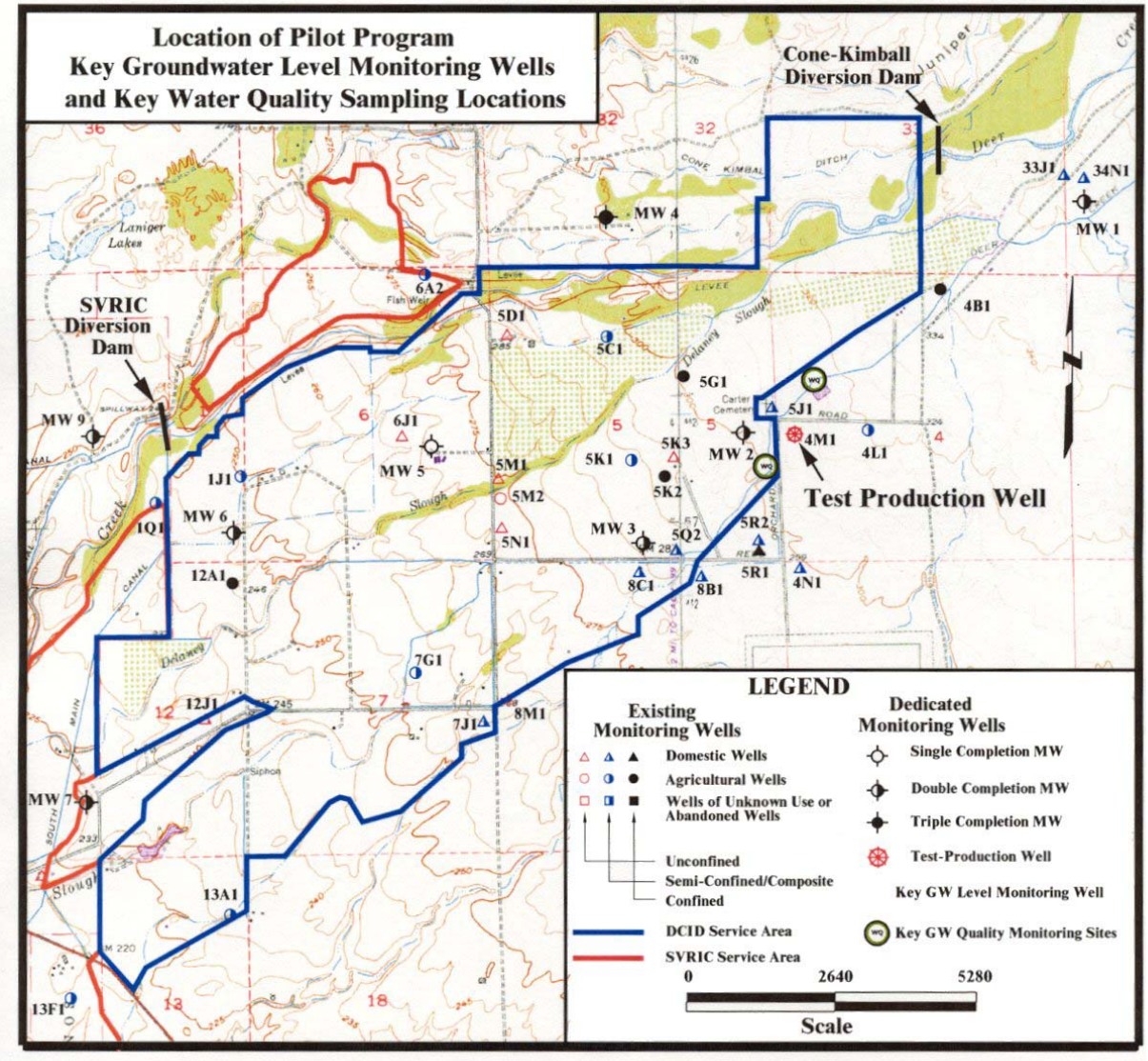


Figure 8. Local Groundwater Monitoring Grid with Key Monitoring Locations.

Pilot Program Reporting

Reporting for the pilot program will consist of a series of monitoring compliance reports following each monitoring period and an annual report at the conclusion of the program. A full description of the reporting schedule is provided in Appendix A (Exhibit A, Attachment 1).

Monitoring compliance reports will provide a comparison of recently measured groundwater levels against the corresponding Key Well hydrograph and warning stage trigger levels. The groundwater level data and compliance reports will be made available to the general public over the Internet, through a link with the Northern District Department of Water Resources web site.

The annual report will summarize the status of groundwater levels and water quality for the DCID project area over the past year, compliance or non-compliance with groundwater management objectives of the water exchange pilot program, evaluation of the program, and recommendations for improvement.

Environmental Documentation

A notice of exemption for the Deer Creek Water Exchange Pilot Program drilling and operations was filed and recorded in November, 2002 with the Tehama County Clerk/Recorder and the California State Clearinghouse Office of Planning and Research. Reasons for the exemption status were listed as;

- Section 15306 - basic data collection, research, experimental management, and resource evaluation activities, which do not result in a serious or major disturbance to an environmental resource.
- Categorical exemption for new construction of limited small new facilities; installation of small new equipment and facilities in small structures; and conversion of the use of small existing structures (Section 15303). This categorical exemption applies to the construction or conversion and location of limited numbers of new small facilities or structures.
- Categorical exemption for minor alteration in the condition of land, such as grading, gardening, and landscaping (Section 15304). Section 15304 applies to minor public or private alterations in the condition of land, water, or vegetation that do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes. This exemption includes grading on land with a slope of less than ten percent.

A copy of the notice of exemption and cover letters is provided in Appendix B.

EXISTING CONDITIONS

The existing conditions surrounding the proposed project area were analyzed from data collected during pre-feasibility work for the Deer Creek Water Exchange Program. An overview of the existing Deer Creek water rights, hydrology, land and water use, geology and hydrogeology are present below.

Deer Creek Irrigation District and Stanford Vina Ranch Irrigation Company (SVRIC) share right to the flow of Deer Creek. Because of this inseparable link, SVRIC has been included in the following summary of water rights, diversions, land and water use, and the Deer Creek hydrology.

Surface Water Rights and Diversions

Established in 1918, Stanford Vina Ranch Irrigation Company (SVRIC) was granted a license by the State Water Commission to divert 15 cfs of Deer Creek. In 1921, SVRIC filed suit against upstream riparian water users claiming excessive upstream diversions were leaving SVIC with little water. In 1923 the courts adjudicated the entire flow of Deer Creek with 65 percent of the flow granted to SVRIC and 35 percent to DCID. In 1926, changes were made to the adjudication to account for 180 acres north of Deer Creek, that were not serviceable by DCID but had water rights under the 1923 adjudication, and to list a small portion of the water right to Sheep Camp Ditch (south of DCID) for stock water. The 1926 decision grants about 66 percent of the Deer Creek flow to SVRIC, 33 percent to DCID and 1 percent to Sheep Camp Ditch. The

Deer Creek adjudication is based on the amount of flow measured at the USGS gage above the DCID diversion (see Figure 6).

Deer Creek Irrigation District has one diversion located about 0.5 miles downstream from the USGS gage, along the south side of Deer Creek, in the northeast one-quarter of section 23, township 25N, range 01W. Since 1998, the volume of water diverted from Deer Creek by DCID has been measured and continuously recorded using an engineered 8-foot parshall flume located just below the main diversion (see Figure 6). Prior to 1998, the amount Deer Creek flow diverted by DCID was estimated using several weirs located further down the canal from the Deer Creek diversion. Table 3 shows the minimum, maximum and average daily diversion of DCID, between April and October of 2000. The maximum average daily diversion for water year 2000, as measured by the DCID parshall flume, is 42 cfs.

DCID Diversion: Water Year 2000					
Month	Average Daily Diversion (cfs)			Ave. Monthly Total	
	Minimum	Maximum	Average	(cfs)	(ac-ft)
April	18	**42**	28	826	1,635
May	15	33	21	661	1,309
June	26	37	32	954	1,889
July	31	36	34	1,052	2,083
August	28	31	29	909	1,800
September	22	33	27	817	1,618
October	5	28	14	419	830
Total:				5,638	11,163

Table 3. Deer Creek diversion by DCID; 2000 agricultural season.

Stanford Vina Ranch Irrigation Company has three diversions; the Cone Kimball, the North Main and the South Main (see Figure 6). The Cone Kimball diversion is on the north side of Deer Creek in the southeast one-quarter of section 33, township 25N, range 01W. The diversion consists of a submerged 16-inch pipe with a propeller and meter.

The North and South Main canals divert from the north and south side of the SVRIC diversion dam in the southeast ¼ of section 01, township 24N, range 02W. The North Main diversion splits into northern and western canals, and is monitored at the head of each split. The northern split of the North Main diversion is monitored using a 2-foot unsubmerged parshall flume, and the western split is monitored using an 8-foot sharp-crested weir.

The largest of the Deer Creek diversions is the SVRIC South Main diversion. Diversions into the South Main Canal are monitored using a 6-foot submerged parshall flume.

Prior to 2002 none of the SVRIC diversions had recording equipment. In 2002 recording equipment was installed along the south main canal. The remaining SVRIC surface water diversions are manually measured and daily recorded by the SVRIC watermaster. The average daily SVRIC diversion between 1997 and 2000, as estimated from the watermaster records, are listed below in Table 4. Table 4 also lists the total average daily, monthly and seasonal diversion by SVRIC between 1997 and 2000. Table 4 shows that the average annual diversion from SVRIC, between 1997 and 2000, was 20,448 acre-feet.

Average Daily SVRIC Diversion: Water Years 1997- 2000						
Month	Average Daily Diversion (cfs)				Totals	
	South Main	North Main (n)	North Main (w)	Cone Kimball	Total Ave. Daily (cfs)	Monthly Total (ac-ft)
April	14.8*	4.4*	12.4*	3.8*	35.4*	1,712
May	30.1	4.7	11.4	4.0	50.2	2,994
June	40.1	6.6	11.3	5.5	63.5	3,673
July	48.2	6.3	15.3	5.7	75.5	4,621
Aug.	42.4	6.3	14.9	5.5	69.1	4,239
Sept.	25.7	5.3	13.0	4.8	48.8	2,895
Oct.	12.9	2.4*	12.8*	5.8*	33.8*	743
TOTALS (ac-ft)	12,140	1,955	4,667	1,687	NA	20,448
Note: N. Main (n) and N. Main (w) are the northern and western splits off the North Main Diversion. * Averages do not include April 1998 and October 1997, where no diversions occurred.						

Table 4. Average Daily Deer Creek diversion by SVRIC for Water Years 1997-2000.

Utilizing the 1997 to 2000 SVRIC watermaster data, the maximum average daily diversion for SVRIC was extrapolated and listed in Table 5. The maximum average daily flow for each of the SVIRC diversions is highlighted in bold. Table 5 shows that the maximum daily diversion for the South Main, North Main (total) and the Cone Kimball is 53.6 cfs, 25.0 cfs and 7.9 cfs respectively. Table 5 also shows that the North Main and Cone Kimball diversions run close to maximum capacity throughout the agricultural season, while the South Main diversion is at maximum capacity from June through August. Based on the recorded maximum average daily diversions between 1997 and 2000, the maximum total diversion capacity for SVRIC is estimated at 82 cfs.

Maximum Daily SVRIC Diversion: Water Years 1997- 2000						
Month	Maximum average Daily Diversion (cfs)				Totals	
	South Main	North Main (north)	North Main (west)	Cone Kimball	Max. Ave. Daily Total (cfs) *	Max. Ave. Monthly Total (ac-ft) *
April	22.4	6.4	**17.4**	**7.9**	40.3	2,397
May	42.3	6.6	16.2	5.5	69.8	4,284
June	50.5	**7.6**	17.2	6.1	77.0	4,576
July	**53.6**	6.6	17.2	6.0	**82.2**	**4,982**
Aug.	48.9	6.6	16.9	6.0	76.2	4,677
Sept.	32.3	6.6	16.6	6.0	60.9	3,620
Oct.	22.2	4.9	15.9	6.0	40.4	1,119
Totals (ac-ft)	13,306	2,366	5,353	2,102	NA	22,357
Note: Maximum diversions for the 1997 to 2000 period are shown in Bold * Maximum Daily and Monthly Totals are based on recorded maximums between 1997 and 2000 and do not necessarily represent the total maximum possible diversion for each period.						

Table 5. Maximum Daily Deer Creek diversion by SVRIC for Water Years 1997-2000.

From the above flow data, the combined maximum Deer Creek diversion capacity of the purveyors is estimated at 124 cfs (42 cfs for DCID and 82 cfs for SVRIC).

Hydrology

The Deer Creek watershed covers approximately 208 square miles, extending from the Lassen National Forest in Plumas County to the Sacramento River, just north of Woodson Bridge. At a gradient of about 32 feet per mile, Deer Creek maintains a perennial flow as it tracks through the mountains, meadows and steep-sided canyons in the upper and middle watershed, before entering the valley floor and merging with the Sacramento River. The Deer Creek watershed boundary is shown in Figure 9.

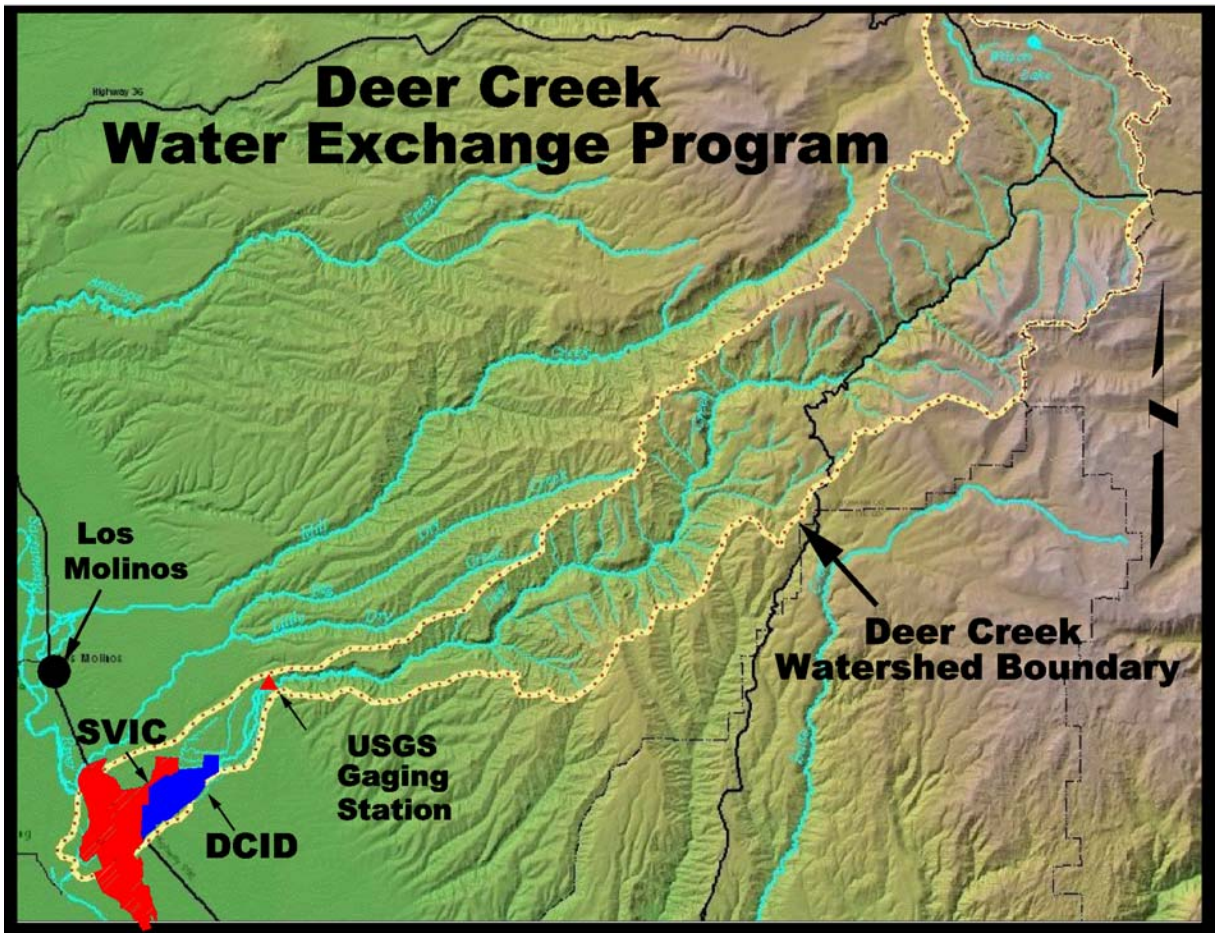


Figure 9. Deer Creek Watershed.

Adjudicated flow for the lower section of Deer Creek is based on the flow, as measured at the USGS gaging station (*Deer Creek Near Vina,* station number: 11383500). Mean daily flow data, between 1920 and 1999, was collected from the USGS station and analyzed for daily minimum, mean and maximum flow. Figures 10 and 11 illustrate the magnitude and range of mean daily flow in Deer Creek, as recorded at the USGS gage.

Figure 10 is a graph showing the minimum, average and maximum mean daily flow for Deer Creek between April and October, as measured at the USGS gage. Figure 10 shows that the peak values for the maximum daily mean flow reach as high as 7,000 cfs and tend to mask the average and minimum flow curves. A closer look at the average and minimum mean daily flow is shown in Figure 11.

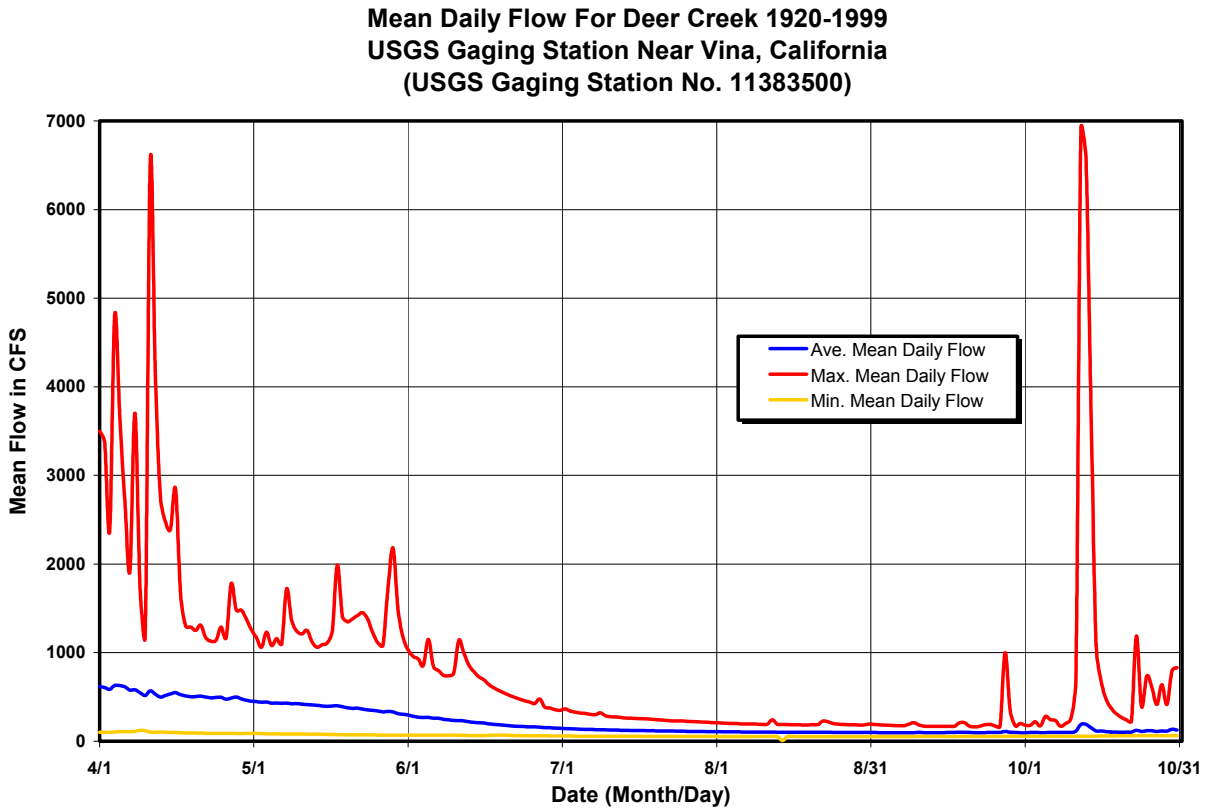


Figure 10. Average, Minimum and Maximum Mean Daily Flow for Deer Creek.

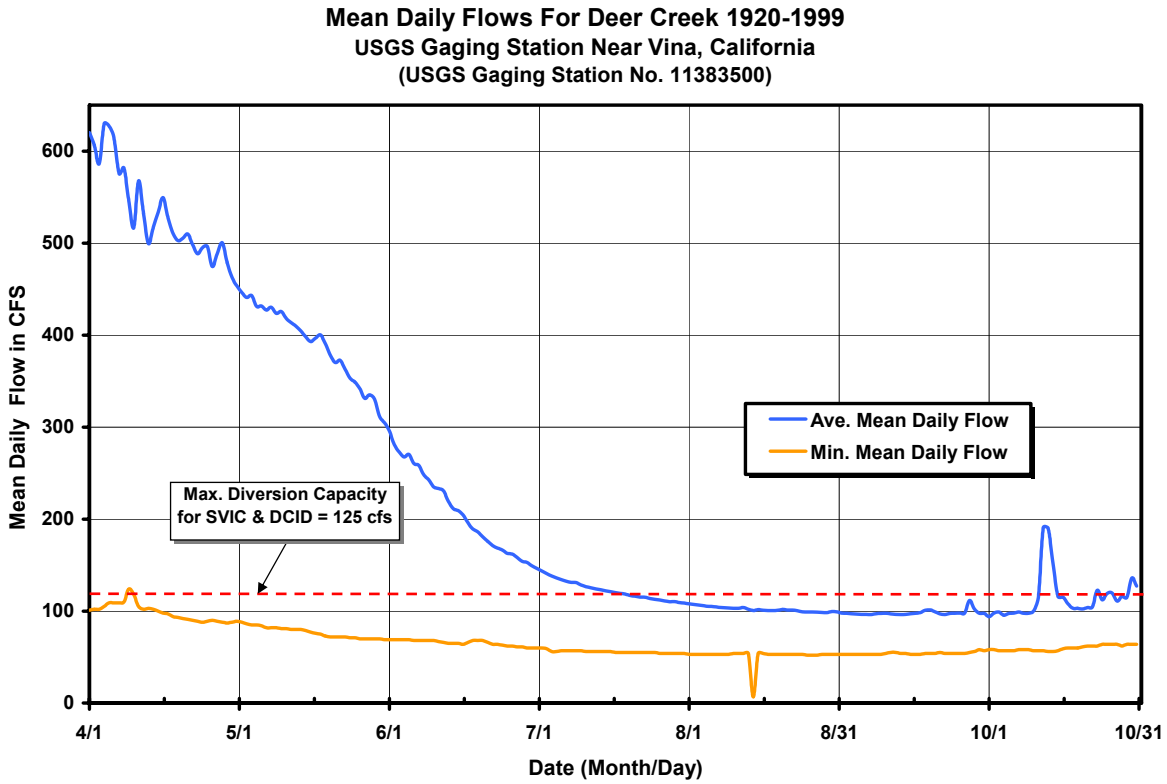


Figure 11. Average and Minimum Mean Daily Flow for Deer Creek.

The average mean daily flow curve in Figure 11illustrats that Deer Creek flows drop off significantly after June and, even during average water years, is less than the maximum DCID/SVRIC diversion requirements for summer periods later than mid-July. The minimum mean daily flow curve in Figure 11 characterizes flow conditions that can be expected during dry water years. The minimum mean daily flow curve shows that, during dry water years, the Deer Creek flow is almost always less than the estimated maximum diversion requirement of 125 cfs for DCID and SVRIC

Land and Water Use

Deer Creek Irrigation District and Stanford Vina Ranch Irrigation Company have water service areas of about 2200 and 6500 acres, respectively. Both surface water and groundwater are used to irrigate agricultural lands in the DCID and SVRIC areas. The Department of Water Resources Northern District conducted land and water use surveys of the SVRIC and DCID areas in 1988, 1994 and 1999. An update of the 1999 land use survey is in progress. A detailed breakdown of the 1999 land and water use survey for DCID and SVRIC is presented in Tables 6 and 7. A map showing 1999 land use for the DCID and SVRIC areas is illustrated in Figure 12 and a 1999 water source map is shown in Figure 13. A summary of the land and water use data for the 1988, 1994 and 1999 surveys is presented in Table 7.

The Department of Water Resources land-use surveys determined the gross acreage for various crops grown during the survey year. The gross acreage is typically reduced by 5% to account for non irrigated lands such as roads, ditches, and canals. The results of the land use survey shows the estimated net irrigated acreage. The water use and the irrigated acreage data are then used to estimate the amount and type of applied water within the DCID and SVRIC service areas.

Figure 13 shows lands within the DCID and SVRIC service areas that are irrigated with surface water, groundwater, or a combination of surface and groundwater, referred to as a mixed source. The water use areas do not represent specific area of application for any single year. Rather, these areas represent the potential for water application of the type indicated

Deer Creek Irrigation District has a service area of about 2200 acres. Table 6 shows that in 1999, about 1900 of the 2200 acres of the DCID service area were in agricultural production. Approximately 700 acres or 37-percent of the irrigated acreage was planted in pasture, while 1100 acres or 58-percent was planted in orchard crops consisting of almonds, walnuts and prunes. The remaining 5-percent of the irrigated acreage is planted in grain crops. Approximately 400 acres were irrigated with groundwater and 1,500 acres were irrigated with surface water.

The total amount of water applied to the 1,900 irrigated acres in the DCID service area is estimated at 6600 acre-feet, with about 5400 acre-feet supplied by surface water and 1200 acre-feet supplied by groundwater. Approximately 82-percent of the applied water is from surface water and 18-percent is from groundwater. Table 6 also indicates that all of the pasture acreage and about one-half of the orchard crops are irrigated with surface water.

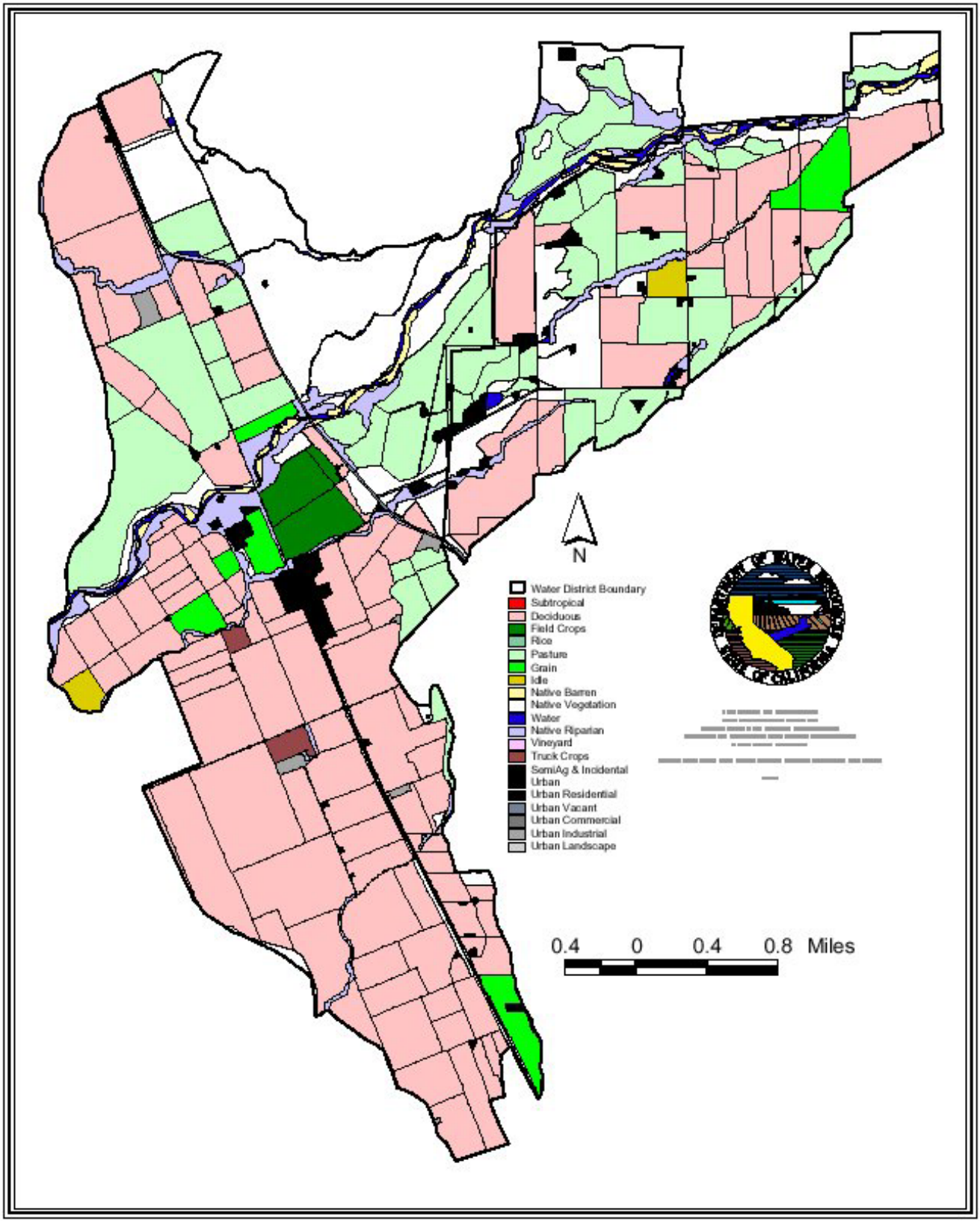


Figure 12. 1999 Land Use for the DCID and SVRIC Service Areas.

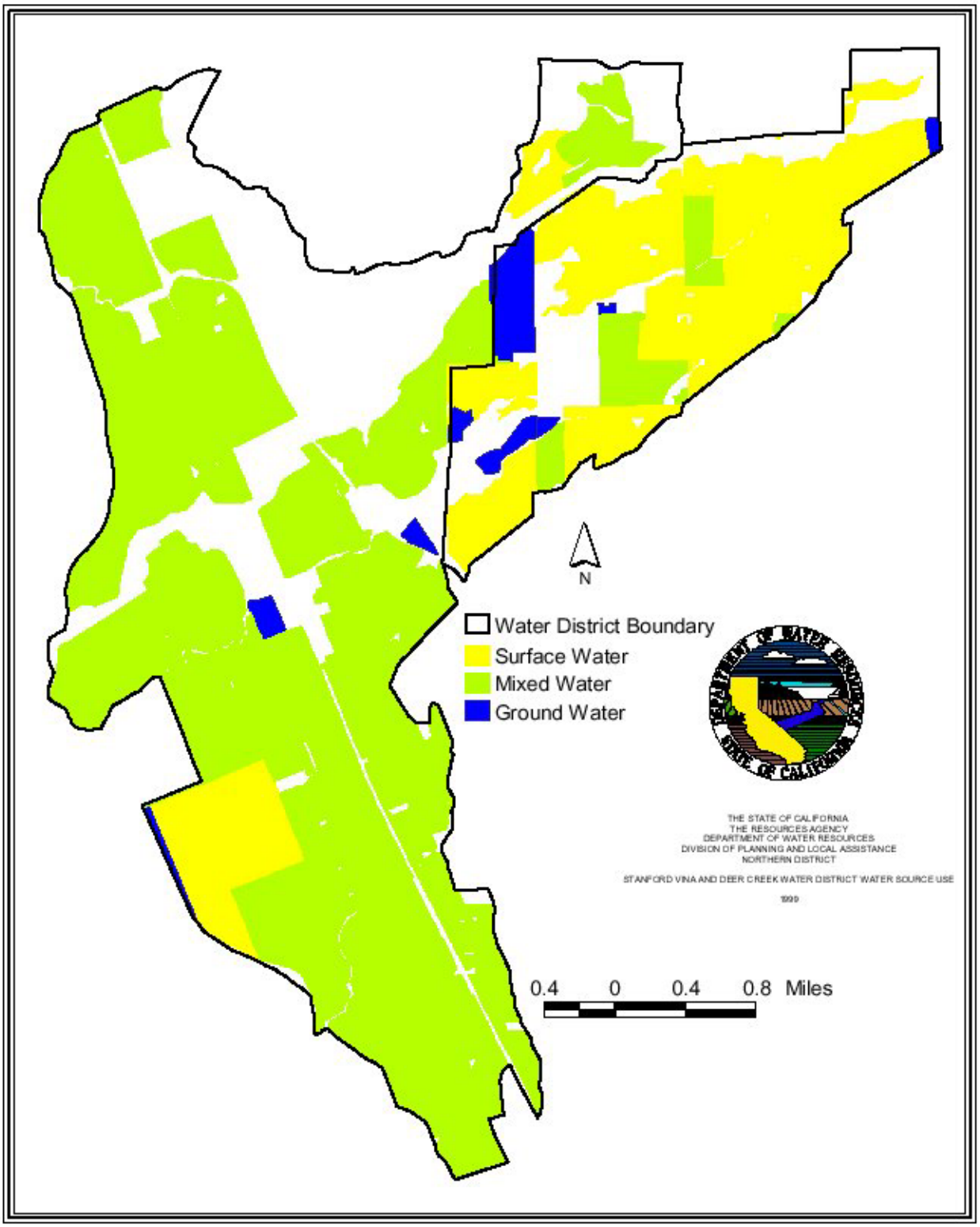


Figure 13. 1999 Water Source Map for the DCID and SVRIC Service Areas.

DEER CREEK IRRIGATION DISTRICT 1999

Crop Type	Net Irrigated Acreage (acres)			ET of Applied Water [1] (acres)			Applied Water (acre-feet)		
	Surface	Ground	Total	Surface	Ground	Total	Surface	Ground	Total
GRAIN	100	0	100	40	0	40	60	0	60
PASTURE	500	0	500	1,600	0	1,600	2,460	0	2,460
PASTURE - X	200	0	200	440	0	440	680	0	680
ALMONDS	300	200	500	690	460	1,150	920	580	1,500
PRUNES	100	100	200	220	220	440	340	310	650
WALNUTS	300	100	400	660	220	880	940	290	1,230
Totals	**1,500**	**400**	**1,900**	**3,700**	**900**	**4,600**	**5,400**	**1,200**	**6,600**

[1] ET = Evapotranspiration of Applied Water

Table 6. 1999 Land and Water Use Data for Deer Creek Irrigation District.

Stanford Vina Ranch Irrigation Company has a service area of about 6500 acres. Table 7 shows that in 1999, about 5000 of the 6500 acres of the SVRIC service area were in agricultural production. Approximately 1100 acres or 22-percent of the irrigated acreage was planted in pasture and alfalfa, while 3700 acres or 74-percent was planted in orchard crops consisting of almonds, walnuts and prunes. The remaining 4-percent of the irrigated acreage is planted in grain and truck crops. Approximately 2100 acres were irrigated with groundwater and 2900 acres were irrigated with surface water.

The total amount of water applied to the 5000 irrigated acres in the SVRIC service area is estimated at 15,800 acre-feet, with about 9400 acre-feet supplied by surface water and 6400 acre-feet supplied by groundwater. Approximately 60-percent of the applied water is from surface water and 40-percent is from groundwater. Table 7 also indicates that 80-percent of the total groundwater use is applied to orchard crops.

STANFORD-VINA IRRIGATION COMPANY 1999

Crop Type	Net Irrigated Acreage (acres)			ET of Applied Water [1] (acres)			Applied Water (acre-feet)		
	Surface	Ground	Total	Surface	Ground	Total	Surface	Ground	Total
GRAIN	100	0	100	40	0	40	60	0	60
ALFALFA	400	0	400	1,120	0	1,120	1,600	0	1,600
PASTURE	300	300	600	960	960	1,920	1,480	1,280	2,760
PASTURE - X	100	0	100	220	0	220	340	0	340
OTHER TRUCK	100	0	100	120	0	120	170	0	170
ALMONDS	100	200	300	230	460	690	310	580	890
PRUNES	700	700	1,400	1,540	1,540	3,080	2,110	1,970	4,080
WALNUTS	1,100	900	2,000	2,420	1,980	440	3,320	2,540	5,860
Totals	**2,900**	**2,100**	**5,000**	**6,700**	**4,900**	**7,600**	**9,400**	**6,400**	**15,800**

[1] ET = Evapotranspiration of Applied Water

Table 7. 1999 Land and Water Use Data for Stanford Vina Irrigation Company.

A summary of the 1988, 1994 and 1999 land and water use surveys for the DCID and SVRIC areas are presented in Table 8. Table 8 shows that the irrigated area within DCID and SVRIC has remained fairly constant between 1988 and 1999. However, some changes in the source and the amount of applied water are indicated. With respect to DCID, the total amount of applied water has consistently decreased since 1988, as the source of irrigation water shifted from surface water to groundwater and subsequently more efficient application methods. In SVRIC, the total amount of applied water increased about 10-percent from 1988, to the drought year of 1994, then declined in 1999 to 5-percent less than the 1988 value. During the 1994 drought year, water source shifted more heavily to groundwater to make up for the drop in surface water supply. However, for normal year water source, groundwater use is about 45-percent less in 1999, than in 1988.

AREA	YEAR	Net Irrigated Acreage			Applied Water		
		Surface	Ground	Total	Surface	Ground	Total
DCID	1988	1,700	200	1,900	7,100	600	7,700
	1994	1,400	300	1,700	6,100	800	6,900
	1999	1,500	400	1,900	5,400	1,200	6,600
	Average:	1,533	300	1,833	6,200	867	7,067
SVIC	1988	1,800	3,100	4,900	7,400	9,300	16,700
	1994	1,600	3,400	5,000	6,400	11,800	18,200
	1999	2,900	2,100	5,000	9,400	6,400	15,800
	Average:	2,100	2,867	4,967	7,733	9,167	16,900

Table 8. Summary Table for 1988, 1994 and 1999 Land and Water Use Surveys; DCID and SVRIC.

Regional Geology and Groundwater Bearing Units

Tehama County lies within the northern portion of the Sacramento Valley Groundwater Basin. The Sacramento Valley Groundwater Basin extends from Red Bluff to the Sacramento-San Joaquin Delta, and is bordered by the Coast Ranges to the west and the Cascade Range and Sierra Nevada mountains to the east. It covers an area of 4,900 square miles which includes all of Sutter county and part of Butte, Glenn, Tehama, Colusa, Yuba, Yolo, Solano, Placer and Sacramento counties.

The Sacramento Valley is a structural basin filled with up to 5 miles of marine and continentally derived sediments deposited almost continuously from the Late Jurassic period to the present. The oldest of these valley sediments were emplaced in a marine environment and typically contain saline or brackish groundwater. Younger sediments were deposited under continental conditions and generally contain fresh groundwater. Sediments thin near the margins of the basin, exposing the older rocks the underlying the Sacramento Valley sediments.

Deformational structures within the Sacramento Valley portion of Tehama County include several faults and folds. The Chico Monocline is a northwest-trending southwest-facing flexure that roughly follows the northeastern boundary of the Sacramento Valley Region, extending from Chico to Red Bluff. In Tehama County, the Chico Monocline deforms the Tuscan Formation and has a dip of up to 25 degrees, where it acts as an eastward aquifer boundary (DWR Bulletin 118-6, 1978). South of Chico, Tuscan beds deformed by the monocline have a gentler slope of approximately 2 to 5 degrees.

The surface geology of the Sacramento Valley portion of Tehama County is comprised primarily of alluvial deposits whose source area is the eroded material derived from surrounding mountain ranges. These sediments were deposited as alluvial fan, terrace, and basin deposits by a network of streams and rivers flowing into the Sacramento Valley. Along the front of the foothills, alluvial fan and terrace deposits of the Riverbank and Modesto formations mark the edge of the valley sedimentary units.

Regionally, the base of post-Eocene continental deposits is commonly considered the approximate base of fresh groundwater in the Sacramento Valley. Within the central portion of Tehama County, adjacent to the Sacramento River, the base of fresh groundwater occurs at depth of about 1700 feet below ground surface. Along the margins of the valley portion of Tehama County, the base of fresh groundwater migrates slightly upward with the tilting marine sediments.

In the Sacramento Valley portion of Tehama County, fresh groundwater-bearing units include the Tehama, Tuscan, Riverbank and Modesto formations. Groundwater in these formations exist largely within the primary porosity associated with the spaces between the individual sand and gravel deposits, and within the secondary porosity associated with fractures and jointing of the more competent volcanic rocks within portions of the Tuscan Formation.

The volcanic sediments of the Tuscan Formation interfinger with the non-marine and non-volcanic sediments of the Tehama Formation in the subsurface. This contact is considered to occur at depth in the vicinity west of the Sacramento River.

Local Geology and Groundwater Bearing Units

Deer Creek Irrigation District lies within the southeastern portion of Tehama County, along the northeastern Sacramento Valley Groundwater Basin. The local geology surrounding the project area is shown in Figure 14. An explanation of the geologic units is provided in Figure 15. Figure 14 also shows the location of two cross-sections through the Deer Creek area. Section A-A' is shown in Figure 16 and Section B-B' is shown in Figure 17. Section A-A is a portion of a more regional cross-section located just south of the Deer Creek that was developed as part of the Department of Water Resources Bulletin 118-7 mapping project. Section B-B' is a more local cross-section through the project area that was developed from program-related drilling and aquifer sampling.

The principal groundwater bearing unit in the Deer Creek project area consists of the Pliocene Tuscan formation. Both domestic and irrigation wells in the area rely on the Tuscan formation as the primary source of water. Quaternary terrace deposit such as the Riverbank and Modesto formations also occur in the area, but only those wells directly adjacent to Deer Creek encounter sufficient thickness to make these formations a reliable source for domestic and irrigation water.

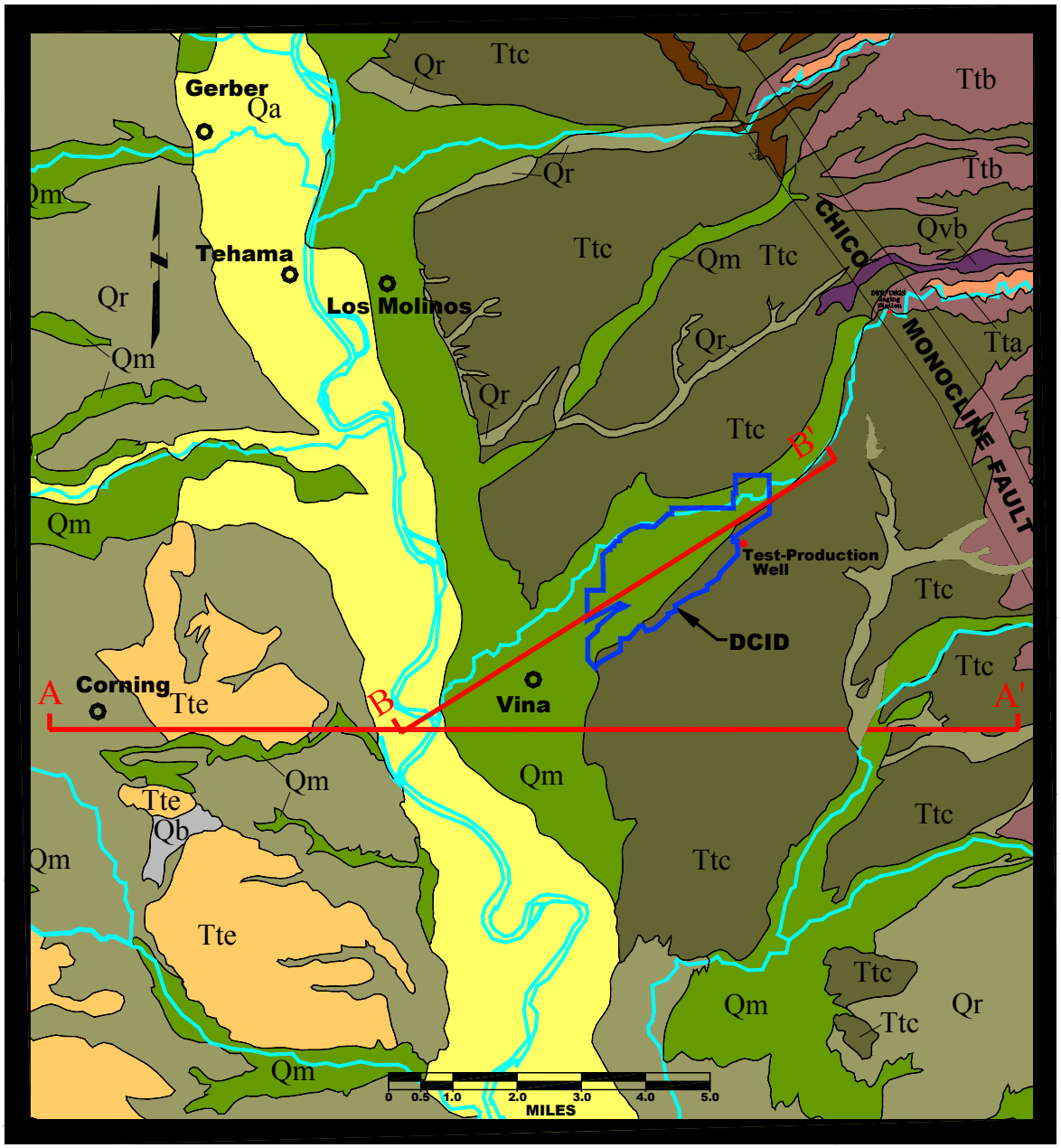


Figure 14. Regional Geologic Map of the Project Area (modified from DWR Bull. 118-7 Draft).

The Tuscan Formation is composed of a series of volcanic mudflows, tuff breccias, tuffaceous sandstone, and volcanic ash layers. Mudflows originated in the vicinity of present-day Lassen Peak and most likely filled ancient stream channels as they flowed toward the valley. Upon reaching the valley, the mudflows fanned out across the valley floor. Some larger lahars may have continued to flow southward in the valley along various drainage channels.

The Tuscan Formation is described as four separate but lithologically similar units, Units A through D, which in some areas are separated by layers of thin tuff or ash units (Helley and Harwood 1985).

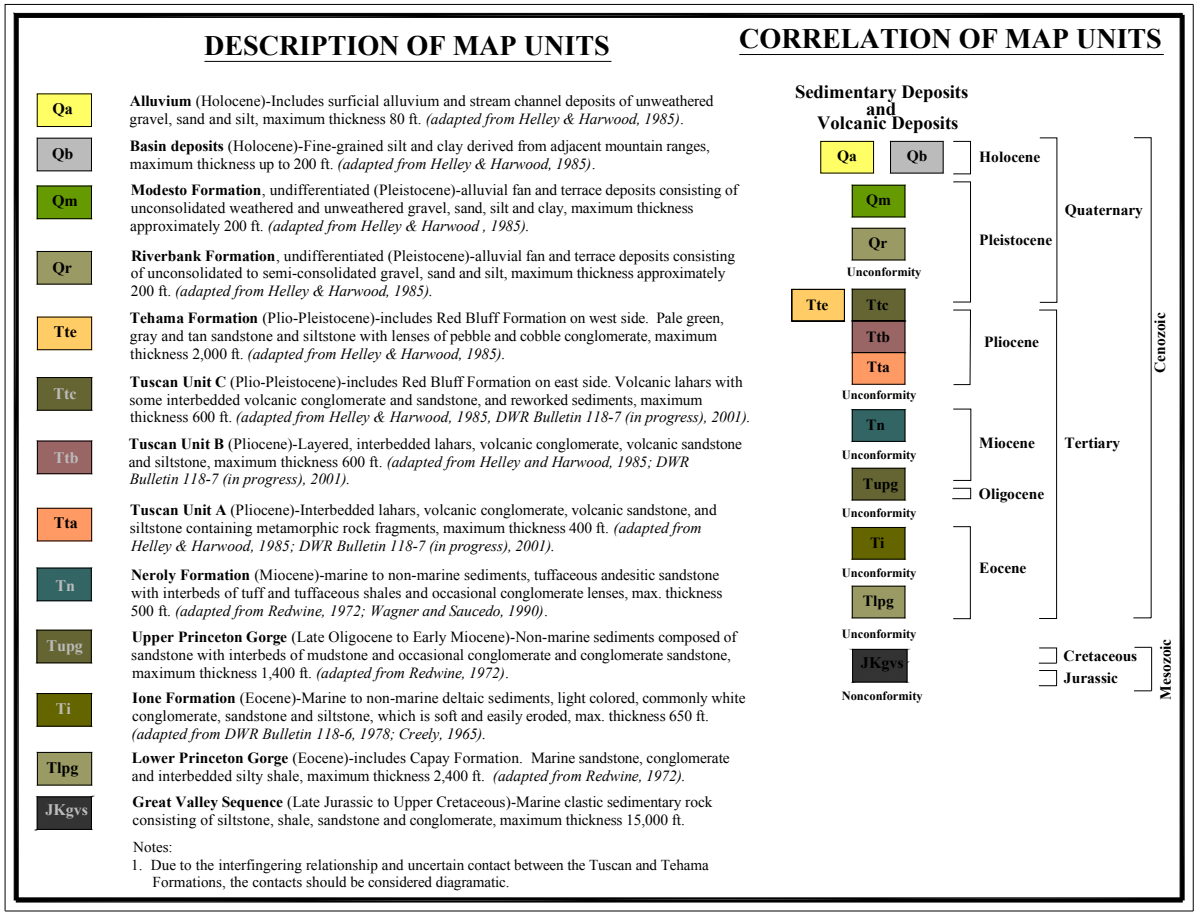


Figure 15. Description of Geologic Map Units (modified from DWR Bull. 118-7 Draft).

Unit A consists of the oldest and deepest of the Tuscan Formation deposits, while Unit D is the youngest. However, Unit D is exposed only in localized areas northeast of Red Bluff. Thus, in the project area Unit C is the youngest and shallowest of the Tuscan Formation deposits. The stratigraphic sequence and estimated thickness of the Tuscan deposits is shown in Figures 16 and 17.

Units A and Unit B are lithologically very similar and are commonly grouped together and described as the "Lower Tuscan". Both units contain a fairly even distribution of lahars volcanic conglomerate, volcanic sandstone and siltstone. However, Unit A does have the slight distinction of comprising a small percentage of metamorphic clasts within the interbedded deposits. In addition, Unit A contains the Nomlaki Tuff, a dacitic pumice tuff, near basal portion of the unit. The Nomlaki Tuff occurs throughout the valley within the basal sections of the Tuscan, Tehama, and Laguna formations.

In the Butte County portion of the valley, Tuscan Unit B is a very productive water bearing system. Because of the lithologic similarity to Unit B, it is hypothesized that Unit A could also

be a productive groundwater source. However, very few wells are constructed solely in Unit A of the Tuscan, so accurate production estimates for this aquifer zone are unavailable.

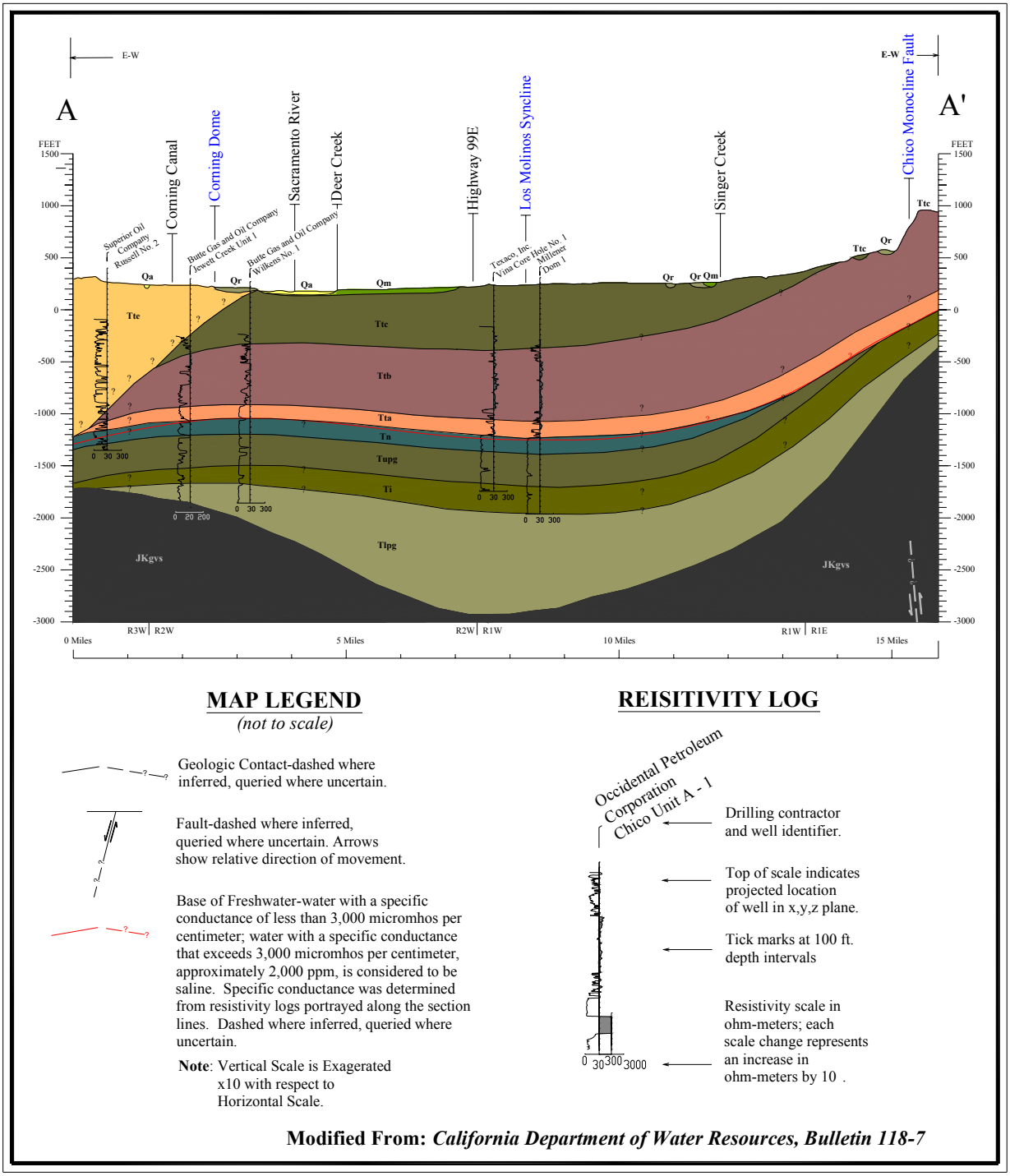
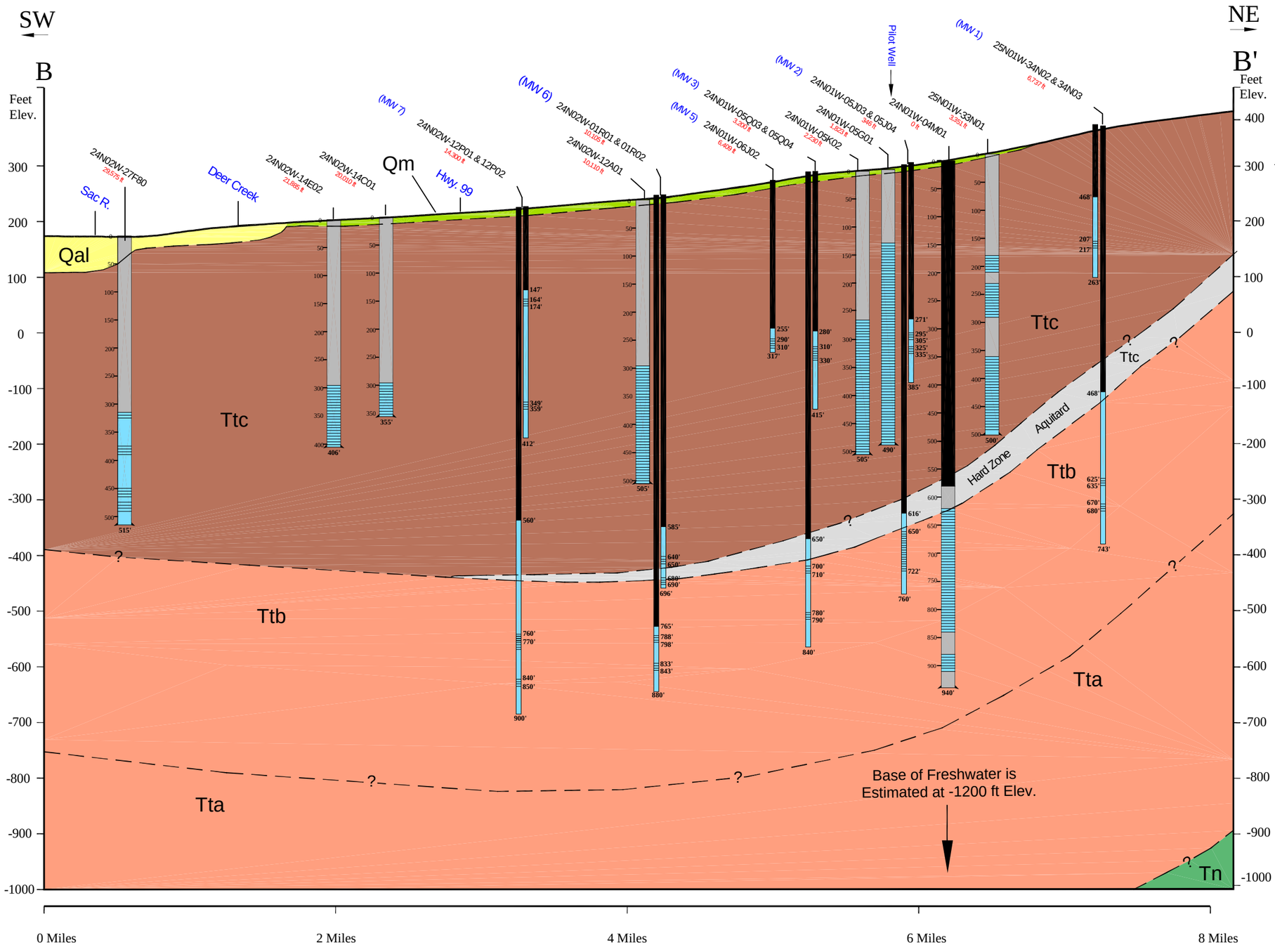


Figure 16. Geologic Cross-Section A-A' Located South of the Deer Creek Project Area.

Figure 17

Geologic Cross-Section B-B' Located Through the Deer Creek Project Area

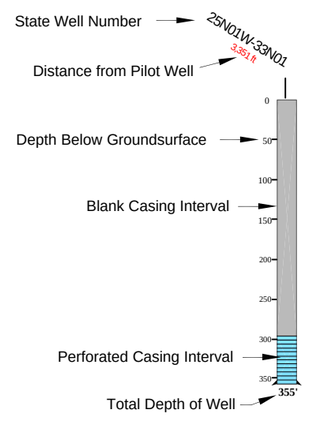


Geologic Map Legend

Geologic Contact-dashed where inferred, queried where uncertain.

Note: Vertical Scale is Exagerated x10 with respect to Horizontal Scale.

Production Well Legend



Monitoring Well Legend

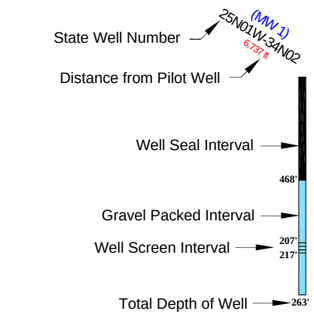


Figure 17 shows that, in the project area, Unit B of the Tuscan begins at depth of about 400 to 600 feet. None of the agricultural wells in the Deer Creek project area appear to draw from either the Tuscan B or A Units.

Unit C consists of more massive mudflow or lahar deposits with some interbedded volcanic conglomerate and sandstone. Towards the eastern foothill area, these lahars are well cemented and form the cap rock for the ridges and canyons the border the eastern drainages. Evidence of wood fragments found in Unit C suggests fast-moving, massive mudflows at the time of deposition. In the subsurface, the low-permeability lahars in Unit C form thick, confining layers for groundwater contained in the more permeable sediments of Unit B. Unit C is also commonly referred to as the "Upper Tuscan".

In the project area most of the agricultural and domestic wells draw from Unit C of the Tuscan Formation. Figure 17 shows the construction and distribution of local wells along the B-B' section line. The area indicated as "hard zone" on the map is thought to be a well cemented mudflow that appeared in several drilling logs. This deep mudflow seems to form a hard cap, or aquitard, above the Unit B in this area. Other less continuous "hard zones" also occur in the shallower portions of Unit C in the project area. Combined with flood application of agricultural water, these discontinuous mudflow layers contribute to a perched aquifer for wells constructed less than about 200 feet deep. Agricultural wells drawing solely from the upper Tuscan in the project area tend to produce between 800 and 2000 gallons per minute.

Groundwater Levels and Direction of Groundwater Flow

Groundwater levels in the project area are a function of location and well depth. In the eastern project area, wells deeper than 200 feet tend to exhibit groundwater levels ranging from 80 to 110 feet below ground surface. Wells less than 200 feet in this area tend to tap into a perched aquifer zone which results in water levels between 30 and 50 feet below ground surface. Further to the west, towards the Sacramento River, the disparity between groundwater levels in shallow versus deep wells lessens, and the depth to groundwater decreased overall.

Groundwater hydrographs illustrate changes in groundwater levels over time. Hydrographs representing the seasonal and long-term groundwater level changes in the domestic and agricultural wells are presented in Figures 18 and 19. The locations of these wells are shown in Figures 7 and 8.

Figure 18 is a hydrograph for well 24N/01W-05J01M. Well 24N/01W-05J01M is a domestic well producing from the shallow portion of the upper Tuscan. Groundwater levels in this well were measured on a monthly basis in 1971, a semi-annual basis (spring-fall) from 1971 to 1995, and is currently being monitored four times a year during March, July, August and October. The hydrograph for well 24N/01W-05J01M shows that the seasonal fluctuation in groundwater levels typically ranges about 5 feet. Examining the hydrograph over the last few years, which included summer monitoring, indicates that the highest groundwater levels typically take place in the summer months during periods of flood irrigation. Conversely, the lowest seasonal levels occur in the winter months when applied irrigation water is kept to a minimum. Long-term comparison of spring-to-spring water levels in Figure 18 shows very little decline during the 1976-77 and 1986-94 droughts, and overall, a fairly stable aquifer system.

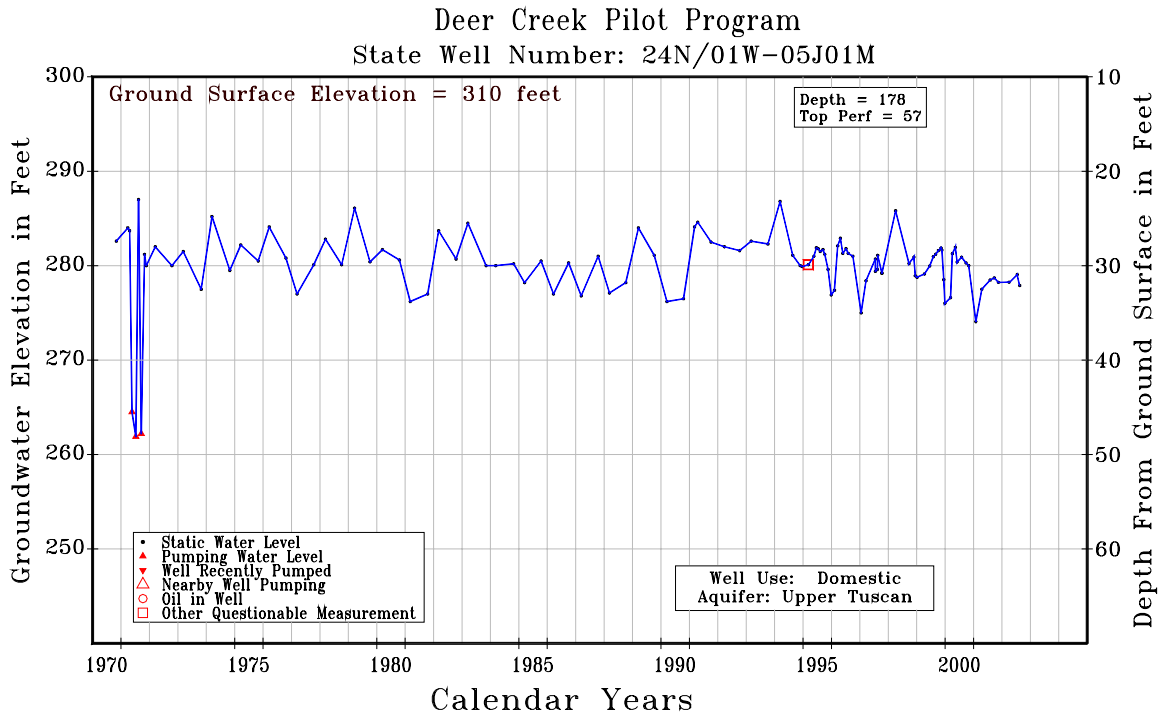


Figure 18, Groundwater Hydrograph for Domestic Monitoring Well 24N01W-05J01

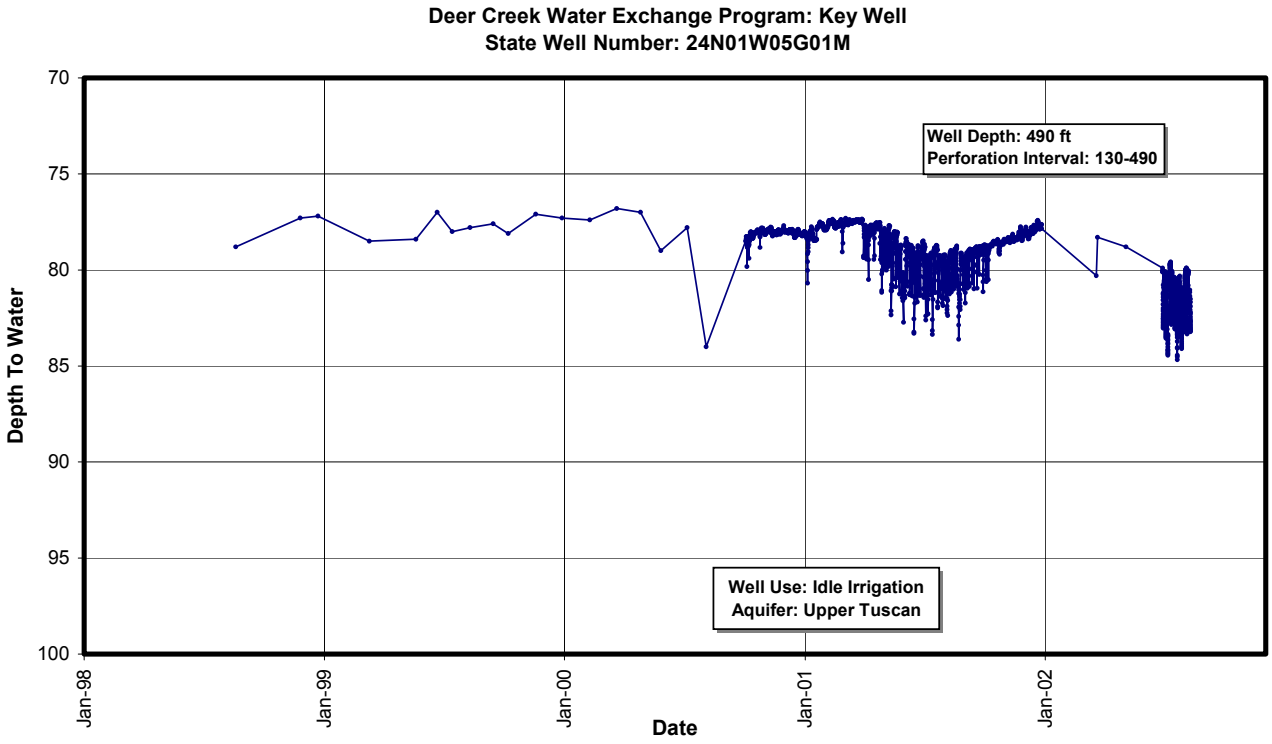


Figure 19, Groundwater Hydrograph for Idle Agricultural Well 24N01W-05G01

Figure 18 is a hydrograph for well 24N/01W-05G01M. Well 24N/01W-05G01M is an idle agricultural well producing from the lower portion of the upper Tuscan aquifer. Groundwater levels in this well were measured on a monthly basis from 1999 to late 2000, when a continuous data logger was installed. Although this well is located less than 1000 feet from the domestic well illustrated in Figure 17, the depth to groundwater averages about 50 feet deeper due to the deeper construction of the well. The hydrograph in Figure 18 shows that the points that make up the average background trend indicate that the seasonal fluctuation in groundwater levels is typically less than 5 feet. The short duration drawdown spikes indicate interference from nearby agricultural wells which produce from the same aquifer interval. Short-term interference from surrounding agricultural pumping is estimated at 5 feet. Although no long-term groundwater level monitoring data is available in the project area for wells that draw from the deeper portion of the upper Tuscan aquifer, data collected over the last few years indicates fairly stable groundwater levels.

Groundwater level data were also used to develop groundwater elevation contour maps for the Sacramento Valley portion of Tehama County. Groundwater contour maps were developed using 2001 spring and summer groundwater level data from monitoring wells in Tehama, Butte and Glenn counties. Groundwater contours are used to help estimate the direction and gradient of groundwater movement and the seasonal changes in groundwater levels. Groundwater levels for 2001 are considered representative of a normal water year. Groundwater contour maps of the Sacramento Valley portion of Tehama County are shown in Figures 20 and 21.

Figure 20 is a groundwater elevation contour map for spring 2001. The groundwater contour lines in Figure 20 represent levels of equal groundwater elevation. Spring groundwater levels are commonly the highest of the year and best reflect the natural groundwater table distribution and direction of movement. Figure 20 shows that the spring groundwater levels vary from an elevation of about 140 feet along the Sacramento River in southern Tehama County, to an elevation of about 500 feet along the west and northwestern portions of the valley. Similar to topographic contour lines, the spacing of groundwater contour lines is an indication of the surface slope, or groundwater gradient. Figure 20 shows that adjacent to the Sacramento River the groundwater gradient is relatively flat and increases along the edges of the valley.

The direction of groundwater movement is illustrated in Figure 20 by a series of red arrows drawn perpendicular to the groundwater elevation contours. Figure 20 shows that the regional pattern of spring groundwater movement is generally towards Sacramento River and the axis of the valley floor. In the Deer Creek Project area groundwater moves in a southwesterly direction, paralleling the direction of Deer Creek flow.

Figure 21 is a contour map showing the seasonal changes in groundwater levels between spring and summer of a 2001. The contours lines in Figure 21 represent areas of equally changing groundwater levels between the spring and summer measurement periods. Figure 21 shows that the seasonal groundwater level fluctuations in the Sacramento Valley portion of Tehama County range from 0 to -40 feet. The areas of greatest groundwater level decline between spring and summer correspond to those areas where groundwater is extracted for agricultural uses during the summer months. Within the Deer Creek Project area, the spring-summer change in groundwater levels is about -5 feet.

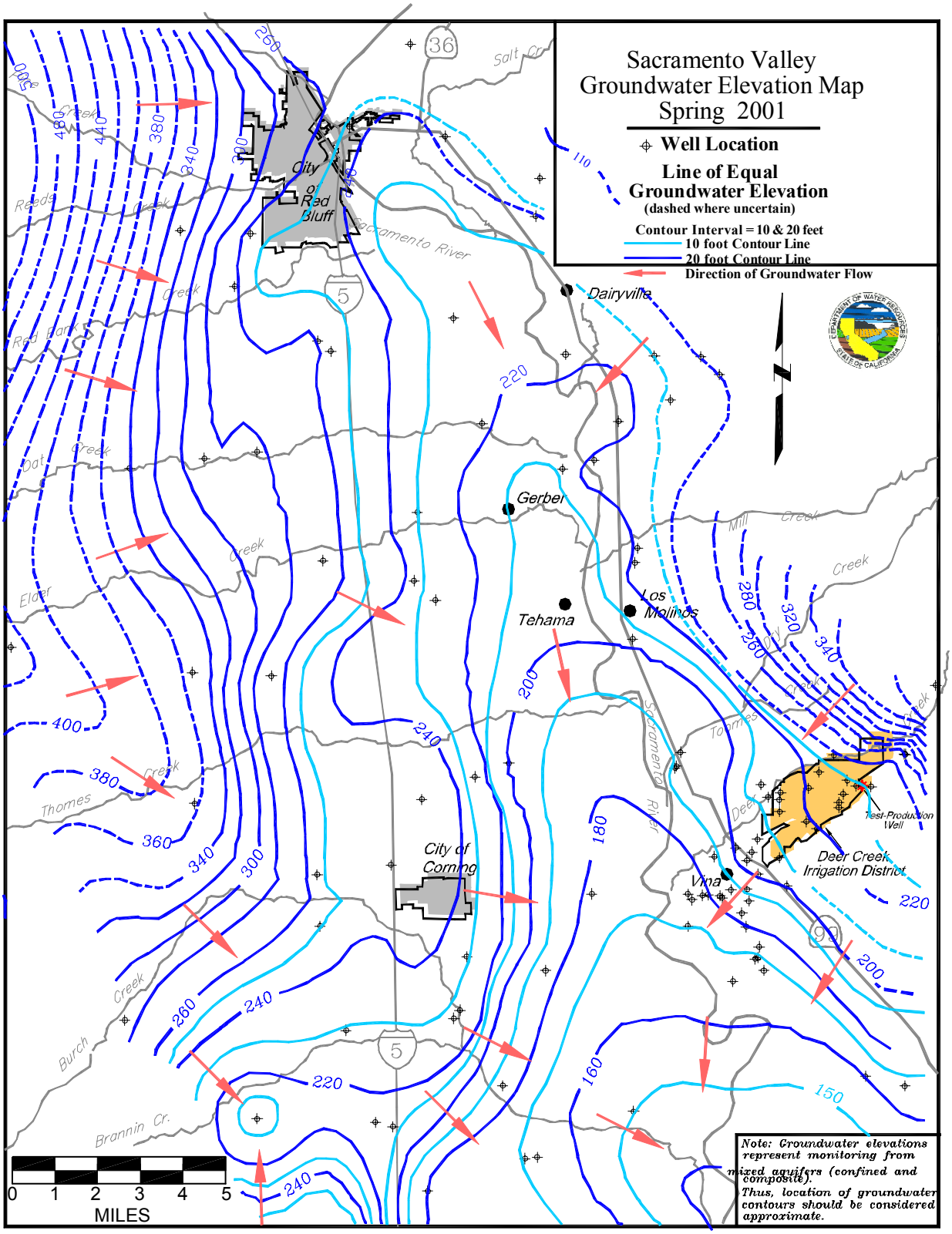


Figure 20. Tehama County, Spring 2001Groundwater Contour Map

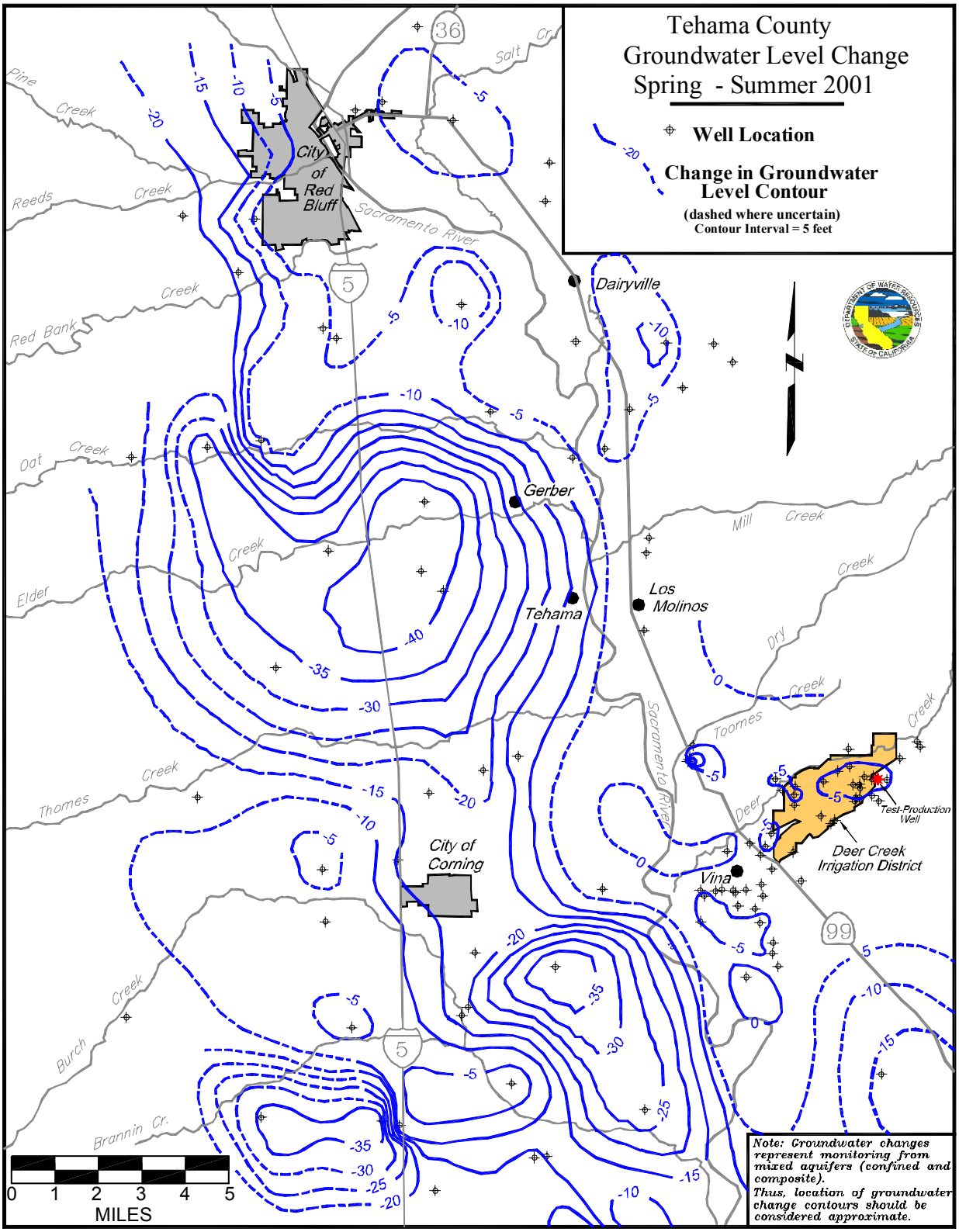


Figure 21. Tehama County, Spring-Summer 2001Groundwater Level Change Map

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DEER CREEK WATER EXCHANGE PILOT PROGRAM TEHAMA COUNTY PERMIT APPLICATION TO EXTRACT GROUNDWATER FOR OFF PARCEL USE

APPENDIX A:

DWR/DCID Contract
Scope of Work

Scope of Work

1. Contractor agrees to establish a Deer Creek Water Exchange Pilot Program. The Program shall test the effectiveness of increasing fish transportation flows in Deer Creek, by allowing groundwater to be used in-lieu of bypassed surface water.

2. Recitals

   (a) Deer Creek Irrigation District is a political subdivision of the State of California, duly organized and existing under Division 11 of the California Water Code and providing water service for the irrigation of lands and crops and for domestic and municipal purposes within the county of Tehama.

   (b) Deer Creek represents one of the State's largest undammed watersheds and provides valuable habitat for anadromous fish, particularly the listed or threatened, spring-run, fall-run and late fall-run Chinook salmon, and steelhead trout. Deer Creek also contributes to valuable surface water beneficial uses, including agriculture, recreation, freshwater habitat, migration, spawning and wildlife habitat.

   (c) Due in part to naturally occurring low flows and diversions by DCID, the upstream migration of spring-run salmon adults or downstream migration of juvenile spring-run salmon may be impeded or blocked during April, May, June or October. Although what constitutes sufficient flow for migration is not known, the blockage or impediments to migration can be alleviated, in part, by DCID bypassing surface water that it would otherwise divert for irrigation purposes.

   (d) DWR and DCID agree that a one-year pilot program, by which DCID shall bypass surface water that it would otherwise be entitled to divert for irrigation purposes in exchange for a like amount of groundwater, shall be instituted.

   (e) The intent of the one-year pilot program is to evaluate the feasibility of a future surface water/groundwater exchange program by assessing the performance of the lower aquifer, identifying the groundwater level changes associated with pumping, and evaluating the monitoring and reporting methods associated with program operations. If findings from the pilot program indicate that

an expanded program is feasible, DWR and DCID agree to work toward implementation of such a program.

(f) It is understood by both parties that the small amount of surface water bypassed during the pilot program may not directly benefit fish passage.

3. The services shall be performed at: Tehama County

4. Description of Services

(a) Well Design and Construction

(1) DWR shall design criteria for well construction, and specifications for pump motor and bowls.

(2) DWR shall construct and drill the project well.

(3) DWR shall pay for all costs associated with the design and construction of the well, pump, motor, housing and electrical connections.

(4) DWR shall pay all operation and maintenance costs associated with the operation of the test-production well for the pilot program.

(5) DWR shall obtain leases, easements, permits and licenses to construct and operate the test production well and related facilities.

(6) DWR shall provide for the installation and operation of program-related groundwater monitoring equipment for the pilot program. At a minimum, these devices will consist of the following equipment at the following locations:

- A flow measuring device on the DCID south main canal;
- A flow meter on the newly installed test-production well; and
- Continuous groundwater level recording instrumentation in surrounding dedicated monitoring wells.

(7) The groundwater management objectives, as outlined in Attachment 1 to Exhibit A, will serve as the operating criteria of the pilot program well.

(8) DWR shall provide DCID with monthly updates of groundwater level and quality data collected during the pilot program. At the end of the pilot program, DWR will submit a report to DCID summarizing the findings of the program, and recommendations for future program operations. DWR shall provide DCID a draft report for review and comment prior to completion of the final report.

(b) Ownership of Well

(1) DCID shall hold, and DWR shall convey to DCID, all rights, title and interest in the well, well site, easements, housing, electrical and other appurtenances associated with the well.

(2) If DCID should no longer exist as a public entity, or not use the well for five years, then DCID shall convey to property owner, or their successor in interest to the property, all right, title and interest in the well, well site, easements, housing, electrical and other appurtenances associated with the well.

(c) Administration

DCID shall assist in the administration of the pilot program by:

(1) Monitoring pilot well performance

(2) Performance of maintenance requirements, including recording well operation schedule and discharge volume, and checking oil levels

(3) Attending public meetings related to the pilot program, attending monthly technical advisory meetings, and coordinating as necessary with local, county and state representatives; and

(4) Reviewing program related reports.

5. CEQA

DCID shall be the lead agency responsible for preparing the appropriate CEQA documentation for this project. DWR will assist in the development of the CEQA document.

6. Pilot Program

It is estimated that the test-production well will produce a volume of water between 2 and 4 cubic-feet per second. During the pilot program the test-production well will be operated for a minimum of sixty days and a maximum of ninety days, in accordance with groundwater management criteria in Attachment 1 to Exhibit A. The total volume of groundwater pumped will not exceed 750 acre-feet. The test-production well will be operated between April and October.

DCID shall work with DWR to try to insure that the amount of surface water bypassed equals the amount of water produced by the test-production well. Depending on hydrologic conditions in the year 2002, surface water may not be bypassed by DCID.

7. Contact Persons

States contact person is:

Dan McManus who can be reached at (530) 529-7373.

Contractors contact person is:

President John Edson
Deer Creek Irrigation District
Post Office Box 154
Vina, California 96092
Phone: (530) 839-2365

Contact persons can be changed upon written notice to the other party.

DEER CREEK WATER EXCHANGE PILOT PROGRAM TEHAMA COUNTY PERMIT APPLICATION TO EXTRACT GROUNDWATER FOR OFF PARCEL USE

APPENDIX A; Exhibit A, Attachment 1

Groundwater Management Objectives

GROUNDWATER MANAGEMENT OBJECTIVES
For the Deer Creek Water Exchange Pilot Program
In the Deer Creek Irrigation District

INTRODUCTION

Deer Creek Irrigation District is located in the lower Deer Creek watershed (see Figure 1). The Deer Creek Water Exchange Pilot Program will test the effectiveness of increasing fish transportation flows in Deer Creek, by allowing groundwater to be used in-lieu of bypassed surface water. Operation of the pilot program will follow the Scope of Work outlined in Exhibit A and the guidelines set forth in the Groundwater Management Objectives listed below. The Groundwater Management Objectives utilize groundwater level and groundwater quality data collected before, during and after pumping to establish a clear set of criteria for pilot program operations.

The overall management goals of the Deer Creek Irrigation District are to maintain the groundwater surface elevation at a level that will assure an adequate and affordable irrigation water supply, and to assure a sustainable supply of good quality groundwater for agricultural and domestic use. In order to maintain this goal, it is recognized that the operational criteria presented in the Groundwater Management Objectives may need to be adjusted as additional operational data for the program are established.

PROGRAM COORDINATION and CHAIN OF AUTHORITY

Groundwater wells installed as part of the Deer Creek Water Exchange Pilot Program will be owned and operated by Deer Creek Irrigation District (DCID). As such, DCID will serve as the Lead Agency for the program. Deer Creek Irrigation District will coordinate management of the Pilot Program with other local and county water management programs. Locally, the Deer Creek Watershed Conservancy has developed a strategic plan for watershed management. At the county level, Tehama County manages groundwater resources through their AB 3030 Groundwater Management Plan and through several groundwater protection ordinances.

The Tehama County AB 3030 Groundwater Management Plan is administered by the Tehama County Flood Control and Water Conservation District (TCFCWCD). The TCFCWCD has established a Technical Advisory Committee (AB 3030 TAC) that serves as an advisory body to the TCFCWCD Board. The TCFCWCD Board and the AB 3030 TAC hold monthly meetings to work on implementation of the AB 3030 plan and to develop policy on local groundwater management issues.

Tehama County also administers several groundwater-related ordinances. Chapter 9.4, "Aquifer Protection", of the Tehama County Code incorporates County Ordinance No. 1617. Tehama County Ordinance No. 1617 requires a permit to extract groundwater for the purpose of using or selling the water for use on lands other than the parcel from which the extraction occurs. Permitting authority of this ordinance is through the Tehama County Board of Supervisors (BOS), but administration of the permitting process is through the Tehama County Health

Agency, Environmental Health Division (EHD). The EHD also oversees permitting associated with drilling and installation of all new wells.

With respect to the Deer Creek Water Exchange Pilot Program, primary coordination of permitting and reporting will be through the Tehama County HED, via the Board of Supervisors. Secondary coordination at the county level will be through the AB 3030 TAC, via the TCFCWCD. At the local level, coordination will be through the Deer Creek Watershed Conservancy, DCID Board and the surrounding private stakeholders.

During operation of the Deer Creek Water Exchange Pilot Program, a Deer Creek Water Advisory Committee (WAC) will be established. The WAC will help oversee the development and compliance of the program, interface with the local, county and State representatives, and work towards a more compressive groundwater management plan for the Deer Creek watershed.

The Deer Creek WAC shall include approximately six (6) to nine (9) persons. At least one representative from each of the following entities will be invited to participate:

- Deer Creek Irrigation District,
- Stanford Vina Irrigation Company,
- Deer Creek Watershed Conservancy,
- Tehama County AB 3030 TAC,
- Tehama County Health Agency, EHD
- Northern District Department of Water Resources,
- California Department of Fish and Game,
- Private groundwater users outside the DCID and SVIC service area, but within the lower Deer area.

Issues regarding program operations and/or noncompliance will be initiated at the local level through the WAC. The Deer Creek WAC will coordinate with, and report to, the State and County through the respective State and County members that serve on the WAC. Official reporting and annual program review associating with the permitting process for the pilot program will coordinated directly with the Tehama County Health Agency EHD. It is the hope and intent that most program issues can be resolved at the WAC level. However, the Tehama County BOS, through the provisions in Ordinance No. 1617, will have the final decision making control over the permitting of program operations.

The chain of partnerships described above is a vitally important tool for providing input and dispensing information to local, county and state groups. The lower Deer Creek area has its own unique set of water management objectives, as do many other local areas within Sacramento Valley. Using the proper chain of partnerships, groundwater management objectives can be established to include local needs, while providing a regional framework of legal authority and protection of groundwater resources.

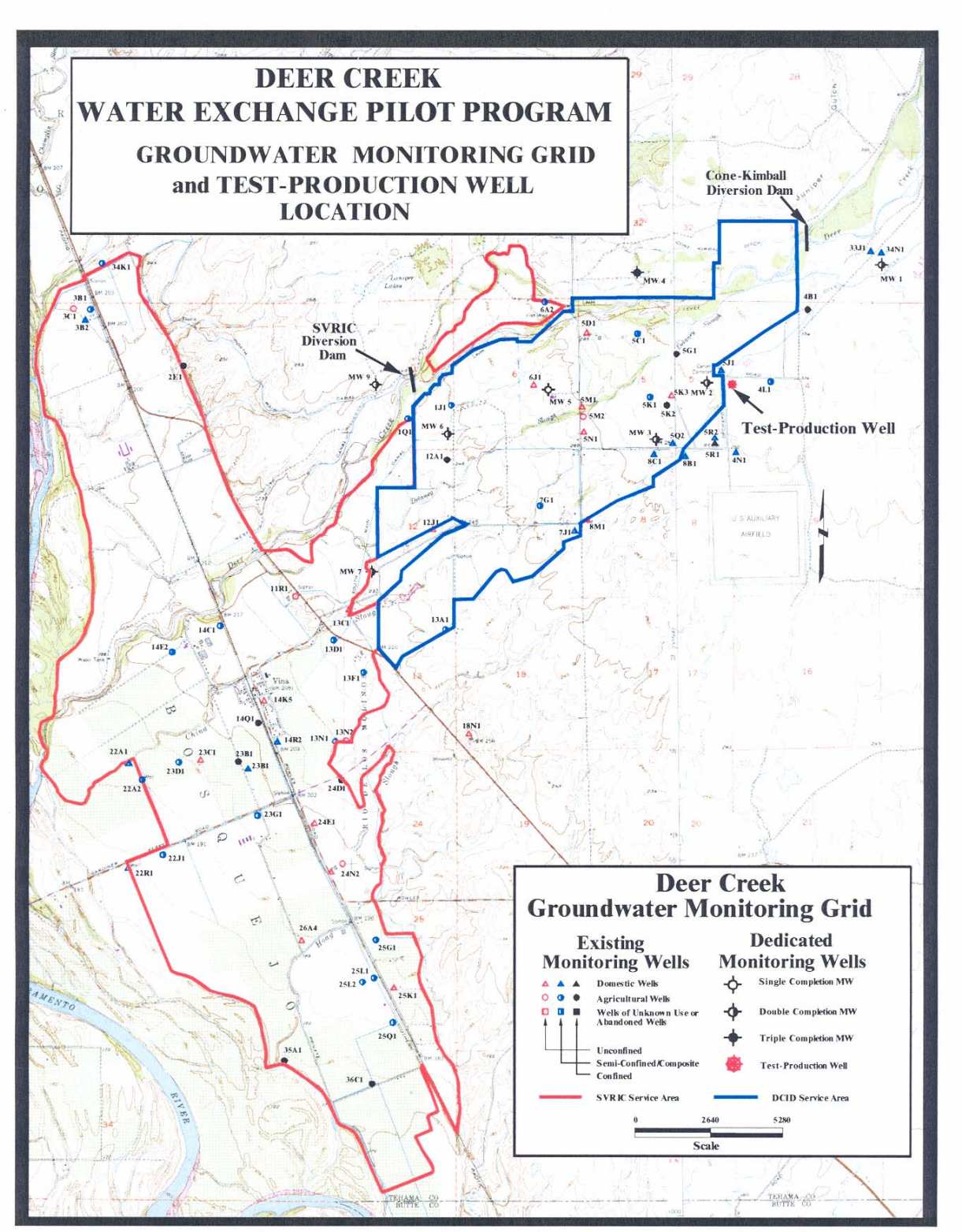

Figure 1. Deer Creek Irrigation District and Lower Deer Creek Groundwater Monitoring Grid.

GROUNDWATER LEVEL CRITERIA

One of the key criteria for program operations is maintaining a predetermined range of acceptable groundwater levels surrounding the pilot program pumping well. The acceptable range of groundwater level fluctuation during program operations was established based on historic groundwater level data and the estimated worse-case decline in groundwater levels associated with pilot well pumping. The predetermined range of acceptable groundwater level fluctuation has been reviewed and is supported by the DCID Board. Operation of the pilot program will proceed as long as there is compliance with the pre-agreed groundwater level criteria. The groundwater level monitoring location, timing, data reporting, acceptable range of fluctuation during program operations, and procedures for noncompliance determination, evaluation and program shutdown are presented below.

Groundwater Level Monitoring Network

Figure 1 shows the lower Deer Creek groundwater level monitoring network and identifies the location of the active monitoring wells (existing irrigation & domestic wells), as well as, the location of dedicated monitoring wells.

Monitoring Well Numbering System

All wells participating in the pilot program will be numbered according to the California State Well Numbering System as illustrated in Figure 2.

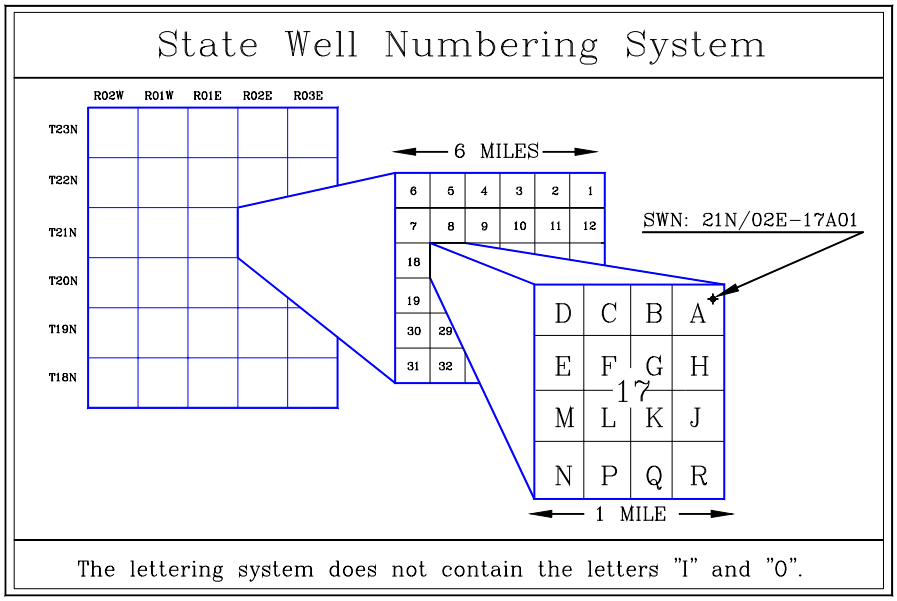

Figure 2. California State Well Numbering System.

Key Groundwater Level Monitoring Wells

Groundwater levels in key monitoring wells will be used to monitor compliance with the predetermined range of acceptable groundwater level fluctuation identified in the groundwater criteria below. Figure 3 shows the location of the seven key wells that will be used to evaluate compliance with the groundwater level criteria. The key wells were selected based on their construction, proximity to the pilot well, and their ability to represent groundwater levels in surrounding agricultural and domestic wells drawing from the upper Tuscan aquifer.

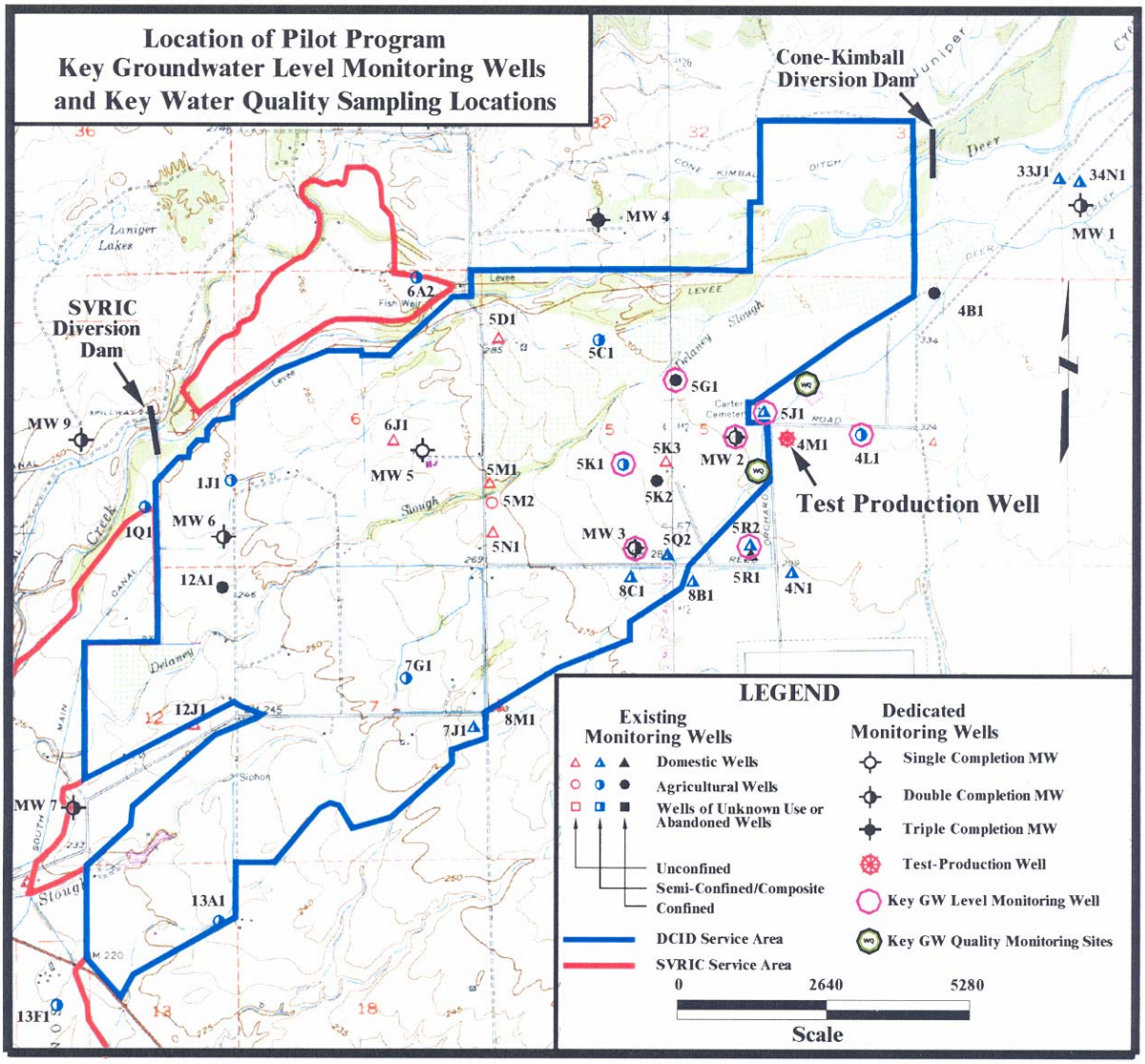

Figure 3. Key Groundwater Level Monitoring Wells and Key Water Quality Sampling Locations.

Key Monitoring Wells State Well Number	Well Use	Aquifer Production Zone	Total Depth (feet)	Perforation Interval (feet)
24N01W-05J01	Cemetery Well	Upper Tuscan	178	58-178
24N01W-05R02	Domestic	Upper Tuscan	160	118-160
24N01W-05J03 (MW 2s)	Monitoring Well	Upper Tuscan	385	271-385
24N01W-05Q03 (MW 3s)	Monitoring Well	Upper Tuscan	415	280-415
24N01W-05G01	Idle Irrigation	Upper Tuscan	490	130-490
24N01W-05K01	Idle Irrigation	Upper Tuscan	260	27-260
24N01W-04L01	Idle Irrigation	Upper Tuscan	526	117-520

Table 1. Key Well Construction and Use.

Groundwater Level Measurements
The Department of Water Resources will be responsible for monitoring groundwater levels during operation of the pilot program. Some of the monitoring wells in pilot program are also part of the summer Tehama County groundwater level monitoring grid. Tehama County will likely also measure groundwater levels in these wells during their regular summer monitoring schedule.

Frequency of Groundwater Level Measurements
Monitoring frequency will vary depending upon monitoring well location and type, and the program operations schedule.

During Periods of Non-Program Operation (pilot well not pumping): During non-program operations, the depth to groundwater will be measured in all wells within the Deer Creek monitoring grid at a minimum frequency of four times per year, according to the following schedule.

- Spring: (March or April)
- Summer: (July and August)
- Fall: (October)

In addition to the above monitoring, during periods of non-program operations, the seven key wells and the remaining dedicated monitoring wells within the Deer Creek monitoring grid will be equipped with automated groundwater level recording equipment. The automated equipment will be set to measure groundwater levels at a minimum frequency of six times per day. The data from this equipment will be downloaded a minimum of four times per year, according to the above schedule.

During Periods of Program Operation (pilot well pumping): During pilot program operations, the depth to groundwater will be measured in the Deer Creek monitoring wells that are east of Highway 99, at a minimum frequency of two times per month between April and October, and monthly from November through March.

In addition to the above monitoring, during periods of program operation, the seven key wells and the remaining dedicated monitoring wells within the Deer Creek monitoring grid will be equipped with automated groundwater level recording equipment. The automated equipment will be set to measure groundwater levels at a minimum frequency of twelve times per day. The data from this equipment will be downloaded two times per month between April and October, and monthly from November through March.

Acceptable Range of Groundwater Level Fluctuation During Program Operations
The acceptable range for groundwater level fluctuation during program operations were estimated for the seven key monitoring wells shown in Figure 2. These ranges are based on:

- review of the historic seasonal fluctuation of groundwater levels in domestic and agricultural wells surrounding the pilot program well,
- the estimated decline in surrounding groundwater levels in domestic and agricultural wells associated with pumping of the pilot well, and

- the ability of nearby third-party groundwater users to maintain an adequate and affordable supply of good quality groundwater for agricultural and domestic use.

In order to have adequate time to respond and make appropriate adjustments to program operations, the range limits are divided into a series of three warning stages. Each warning stage corresponds to a progressive increase in the decline in groundwater levels, and represents further movement towards noncompliance with the groundwater level criteria and eventual shutdown of program operations. Each warning stage also triggers a sequence of program management review and actions designed to alleviate any additional groundwater level decline.

Definition of Groundwater Level Warning Stages
The warning stages are develop and adopted by the DCID board. The stage criteria will also be reviewed by Tehama County AB 3030 TAC and EHD, and by local landowners during and a public meeting. The warning stages are subject to approval the Tehama County BOS through the permitting process for Tehama County Ordinance No. 1617. It is understood that adjustments to the warning stage criteria may be needed as data is collected during the pilot program. Procedures for adjustment to a warning stage will be similar to the initial development of the warning stage(s).

The historic groundwater level data along with the three warning stages for the seven key wells are presented in Figures 4 through 10. Stage 1, Stage 2 or Stage 3 warnings will be issued by the groundwater level monitoring staff when the measurements indicate that the following criteria have been met.

- Stage 1 Warning will be declared when the static groundwater level in any of the Key Wells falls below the Stage 1 warning line.
- Stage 2 Warning will be declared when the static groundwater level in any of the Key Wells falls below the Stage 2 Warning line.
- Stage 3 Warning will be declared when the static groundwater level in any of the Key Wells falls below the Stage 3 Warning line.

Upon recommendation of the DCID and approval of the Tehama County BOS, a Stage 1 and Stage 2 Warning may be rescinded when the groundwater levels rise above the corresponding Stage 1 Warning Line in the non-compliant Key Well(s).

Upon recommendation of the DCID and approval of the Tehama County BOS, the Stage 3 Warning may be rescinded when the groundwater levels rise above the Stage 2 Warning Line in the non-compliant Key Well(s). A Stage 3 Warning may also be temporarily downgraded to a Stage 2 Warning if, after review of all of the groundwater level data, the affected landowners, the DCID Board, and the Tehama County BOS unanimously agree to the temporary downgrade.

Evaluation for Compliance with Groundwater Level Criteria
Following each monitoring period, the Department of Water Resources will evaluate the groundwater level data for determination of compliance with the groundwater level criteria as stated in the Groundwater Management Objectives and shown in the Key Well Figures 4 through 10.

Compliance Reporting and Groundwater Level Data
During program operations, the Department of Water Resources will develop groundwater level compliance reports within 5 days of each monitoring period. Each report will provide a comparison of recently measured groundwater levels against the corresponding Key Well hydrograph and warning stage trigger levels. The groundwater level data and compliance reports will be made available to the general public over the Internet, through a link with the Northern District Department of Water Resources web site.

If wells are found to be in noncompliance with the groundwater level criteria, a noncompliance report will be submitted by the Department of Water Resources to the DCID Board and the Tehama County EHD within five (5) days of the last monitoring period. The noncompliance report will include information as to the regional extent and magnitude of the noncompliance and the character of the compliance violation (Stage 1, 2 or 3 Warning Level).

Response Action for Noncompliance with Groundwater Level Criteria
A series of response actions for each warning level are listed below. The intent of the following list is to provide a minimum level of required response actions, thereby maintaining flexibility for further action, as needed and appropriate, to maintain the general program goals of sustaining the groundwater resource while minimizing third-party impacts. Therefore, the magnitude and extent of possible response actions shall not be limited to those identified below:

Stage 1 Warning - Stage 1 response actions shall include remeasuring groundwater levels and reassessing the appropriateness of the GMO groundwater level criteria with respect to the given circumstances. The Department of Water Resources shall collect and present all pertinent hydrological data to the DCID Board, the EHD and the WAC for review. The WAC shall investigate possible causes for the noncompliance, and develop recommend actions to resolve the Stage 1 noncompliance. These recommendations shall be made in a timely manner not to exceed five (5) days after the reporting of the Stage 1 noncompliance. It shall be the intent of the review group to first make recommendations that focus on resolving the noncompliance through management actions and negotiations with all parties in the affected area. Additional action to help identify the cause for the noncompliance may include, but not be limited to, increasing the frequency of groundwater monitoring and re-assessing the existing appropriateness of the GMO groundwater level criteria.

Stage 2 Warning - Stage 2 response actions shall include more extensive monitoring and evaluation of the GMO groundwater level criteria with respect to the given circumstances. The Department of Water Resources shall collect and present all pertinent hydrological data to the DCID Board, the EHD and the WAC for review. The WAC shall investigate possible causes for the noncompliance, and develop recommend actions to resolve the Stage 2 noncompliance. These recommendations shall be made in a timely manner not to exceed five (5) days after the reporting of the Stage 2 noncompliance. Depending upon the circumstances surrounding the Stage 2 noncompliance, actions at this time could include shutting down the pilot program well if a Stage 3 noncompliance appears imminent. If the progression of groundwater levels towards a Stage 3 noncompliance appears slow or unlikely, other operational management methods may be implemented to avoid further decline of groundwater levels. The methods may include, but not be limited to, partial shutdown of the pilot well during periods of peak interference with surrounding pumping wells, reduction in the volume of daily groundwater extraction from the

pilot well or voluntary water conservation measures. Implementation of Stage 2 management actions may require action by the Tehama County BOS.

Stage 3 Warning - Stage 3 management actions shall consist of terminating the groundwater pumping associated with the pilot program and collecting groundwater level recovery data in the surrounding wells. Groundwater level recovery data will be collected by the Department of Water Resources and presented to the DCID Board, the EHD and the WAC for review. The WAC shall investigate the recovery from Stage 3 noncompliance levels, and develop recommend actions as to further program operation.

Supporting Data
When possible, groundwater level and groundwater quality data from surrounding Tehama County areas will be used to support evaluation of existing conditions in the DCID area.

GROUNDWATER QUALITY CRITERIA

Maintaining a minimum level of acceptable water quality from the pilot program pumping well is the second criteria for program operation. The water quality criteria will require that groundwater from the pilot well will be maintained above the Maximum Contaminant Level (MCL) established for agricultural use in the United States by the Food and Agriculture Organization of the United Nations. For some minerals and nutrients, no agricultural MCL's have been established. In these situations, water quality from the pilot well will be maintained at level that is equal to, or better than, the existing quality of surface water that is currently being diverted. The water quality standards for agriculture are listed in Table 1.

The range of acceptable groundwater quality has been reviewed and is supported by the DCID Board. Operation of the pilot program will proceed as long as there is compliance with the pre-agreed to groundwater quality criteria. The location and frequency of groundwater quality monitoring, the reporting of the data, and management action for noncompliance are presented below.

Water Quality Monitoring Network
Figure 2 shows the water quality monitoring network and identifies the location of the surface and groundwater monitoring sites. All wells participating in the pilot program are numbered according to the California State Well Numbering System illustrated in Figure 2.

Key Water Quality Monitoring Sites
Three key water quality monitoring sites will be used to monitor compliance with the water quality criteria.

- Site 1: Sample and test surface water quality in the distribution system, above the point where groundwater from the pilot well discharges into the system.
- Site 2: Sample and test the groundwater quality as it discharges from the pilot well.
- Site 3: Sample and test the surface water quality in the distribution system below the point where groundwater from the pilot well discharges into the system.

Water Quality Sampling and Testing

The Department of Water Resources will be responsible for field collection and testing of surface and groundwater quality samples. Analytical testing will be conducted at a State of California approved laboratory and will include analysis for minerals, trace metals and nutrients. Minerals analysis will include testing for conductivity, pH, temperature, alkalinity, total dissolved solids, total hardness, boron, calcium, chloride, magnesium, potassium, sodium and sulfate. Trace metal analysis will include testing for aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium and zinc. Nutrient analysis will include testing for ammonia, dissolved orthophosphate, nitrite, nitrate, and total phosphorus.

Parameter	**Aluminum**	**Arsenic**	**Boron**	**ASAR [2]**	**Cadmium**	**Chloride**	**SC [3]**	**TDS [4]**
Ag. MCL [1] (mg/l)	5.0	0.1	0.7	< 3	0.01	106	0.7	450
Parameter	**Manganese**	**Copper**	**Nickel**	**Iron**	**Selenium**	**Lead**	**Zinc**	
Ag. MCL [1] (mg/l)	0.2	0.2	0.2	0.3	0.02	5.0	2.0	

1. MCL = Agricultural Maximum Contaminant Level
2. ASAR = Adjusted Sodium Absorption Ratio
3. SC = Specific Capacity measured in micro-mhos/cm
4. TDS = Total Dissolved Solids

Table 1. Agricultural Water Quality Standards Established by Food and Agriculture Organization of the United Nations.

Frequency of Water Quality Monitoring

The frequency of water quality monitoring at the three key sites will depend somewhat on the analytical results of the pre-project sampling. However, based on historic surface water and groundwater quality data for the area, it is estimated that water quality samples will be collected according to the following schedule.

- At least once prior to the start of the start of the pilot program pumping,
- Once within 5 days after the start of the pilot program,
- Once every 30-days for subsequent program pumping, and
- Once at the seasonal conclusion of the program.

Water Quality Warning Stages

Unlike groundwater levels that can fluctuate significantly depending upon the surrounding aquifer demand, groundwater quality is slightly more of a fixed quantity. Although there may be some fluctuation in groundwater quality as isolated aquifer zones become flushed and recharged, by in large, the fluctuations won't likely be significant. Because of these factors, there is little benefit in developing a series of warning stages for decreasing water quality. Instead, following each monitoring period, the Department of Water Resources will evaluate the surface and groundwater water quality data for compliance with the MCL's for agricultural use as listed in Table 1.

Compliance Reporting of Water Quality Data
During program operations, the Department of Water Resources will submit the analytical results from the water quality testing within 5 days of receiving the data from the lab, and within 14 days of the sampling date. Each report will provide a comparison of recently measured water quality data against the agricultural MCL's. The water quality data will be made available to the general public over the Internet, through a link with the Northern District Department of Water Resources web site.

Response Action for Noncompliance with Water Quality Criteria
If wells are found to be in noncompliance with the water quality goals in Table 1, the Department of Water Resources will develop and submit to the DCID Board, the EHD and the WAC recommend actions to improve water quality. The recommended corrective actions will vary depending upon which water quality parameters are exceeding the agricultural MCL. Corrective actions may include, but not be limited to, mixing of poor quality water with water of a higher quality, treatment of the poor quality water or termination of pumping from the pilot well.

ANNUAL REPORTING

An annual report will be prepared in the fall at the conclusion of the groundwater pumping. The annual report will summarize the status of groundwater levels and water quality for the DCID project area over the past year, compliance or non-compliance with groundwater management objectives of the pilot water exchange program, evaluation of the program and recommendations for improvement. Annual evaluation of the Deer Creek Groundwater Exchange Pilot Program should identify the effectiveness of the program for increasing fish transportation flows, providing clear groundwater management criteria for program operations, and maintaining local and county goals for groundwater management.

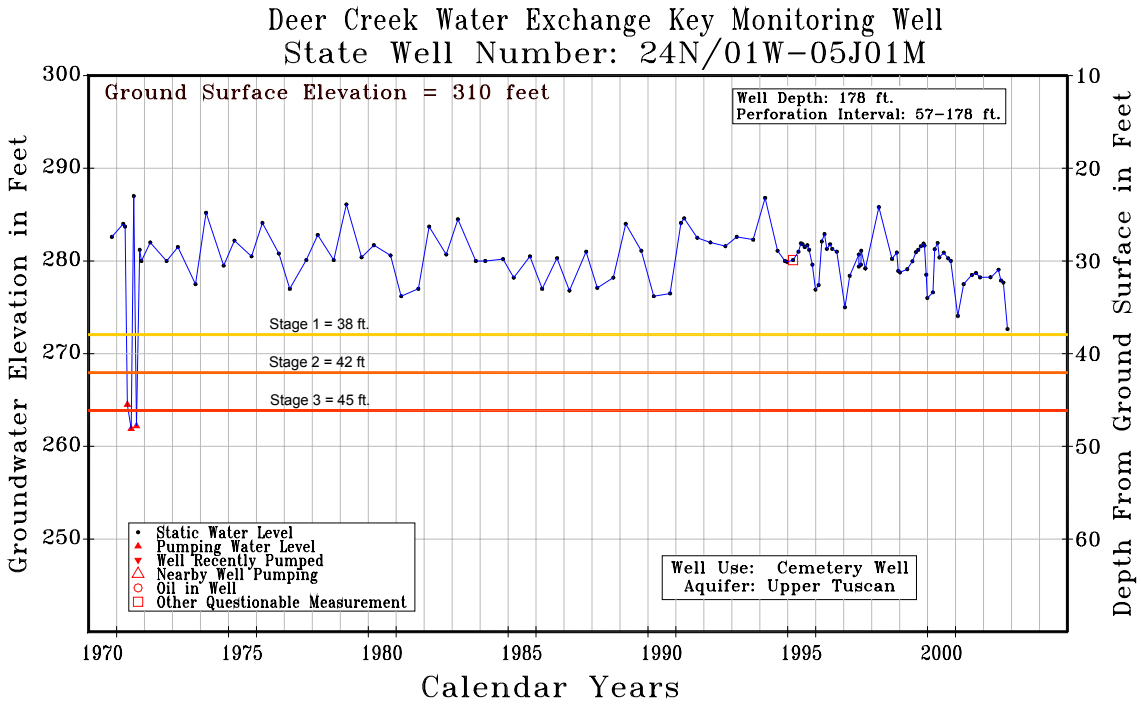

Figure 4. Groundwater Level Stages for Key Well: 24N/01W-05J01

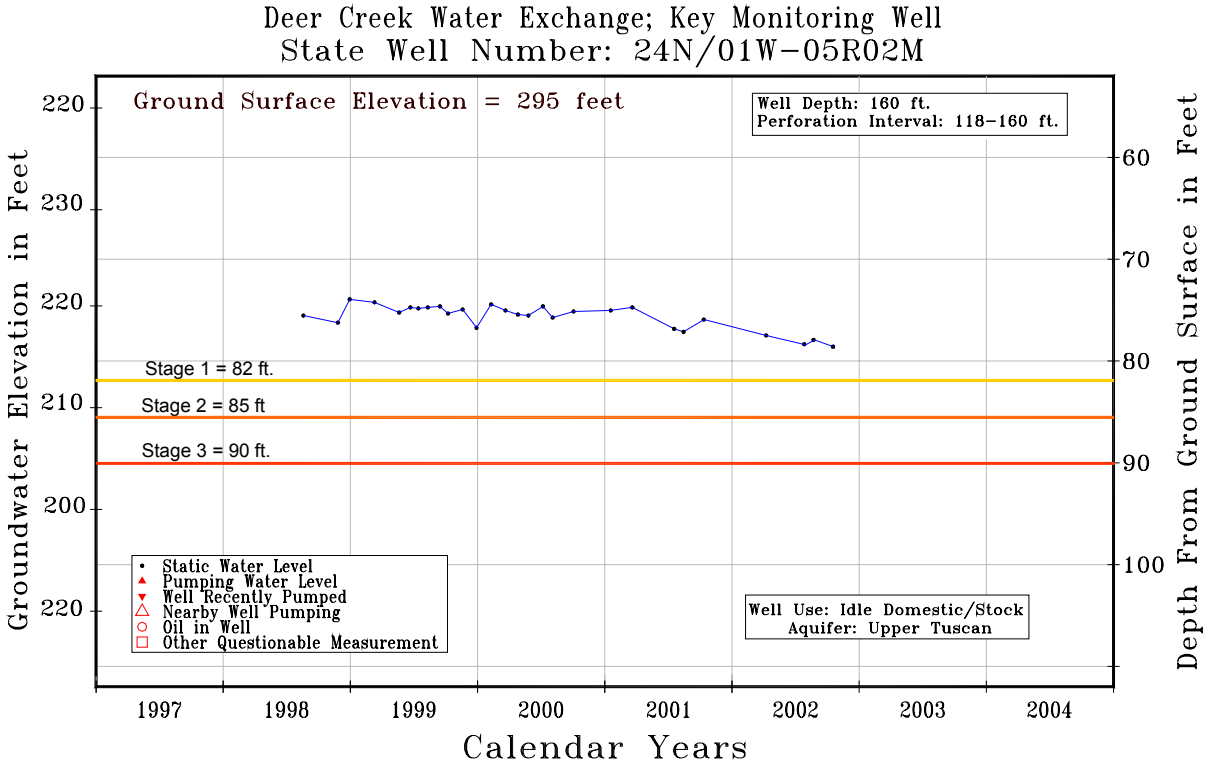

Figure 5. Groundwater Level Stages for Key Well: 24N/01W-05R02

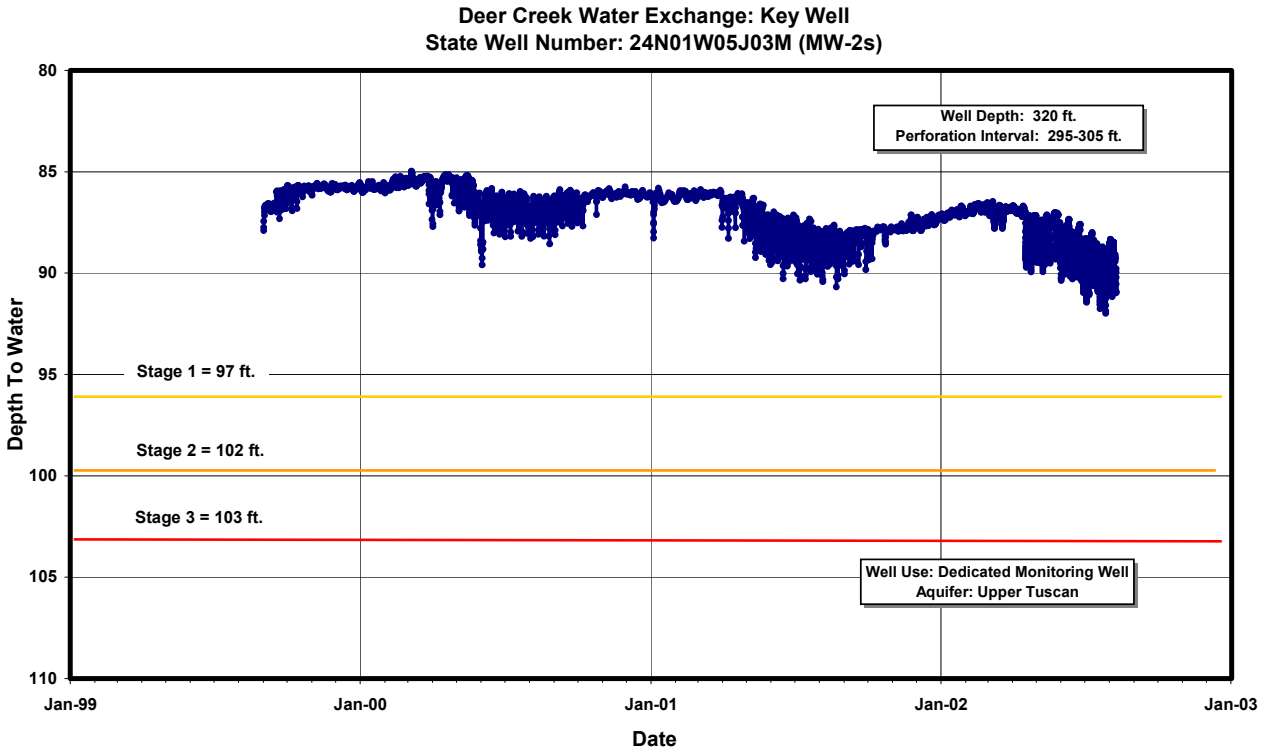

Figure 6. Groundwater Level Stages for Key Well: 24N/01W-05J03 (MW 2s)

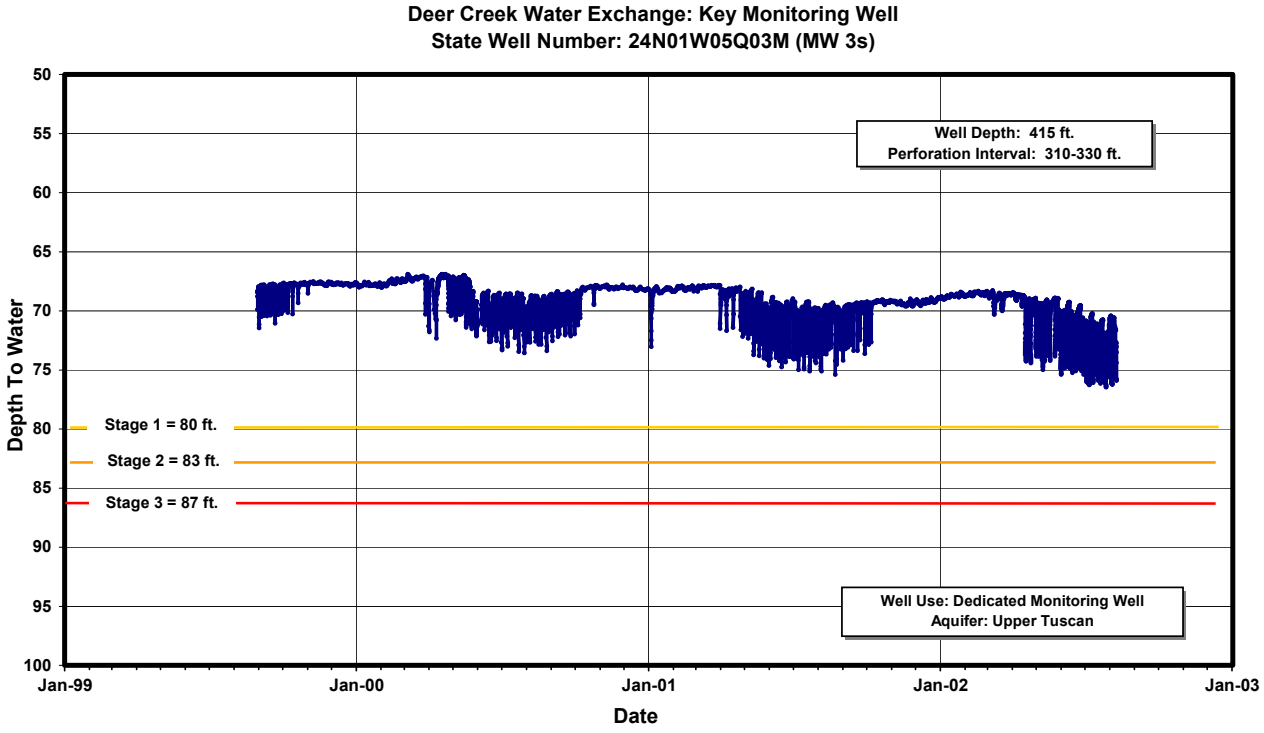

Figure 7. Groundwater Level Stages for Key Well: 24N/01W-0Q03 (MW 3s)

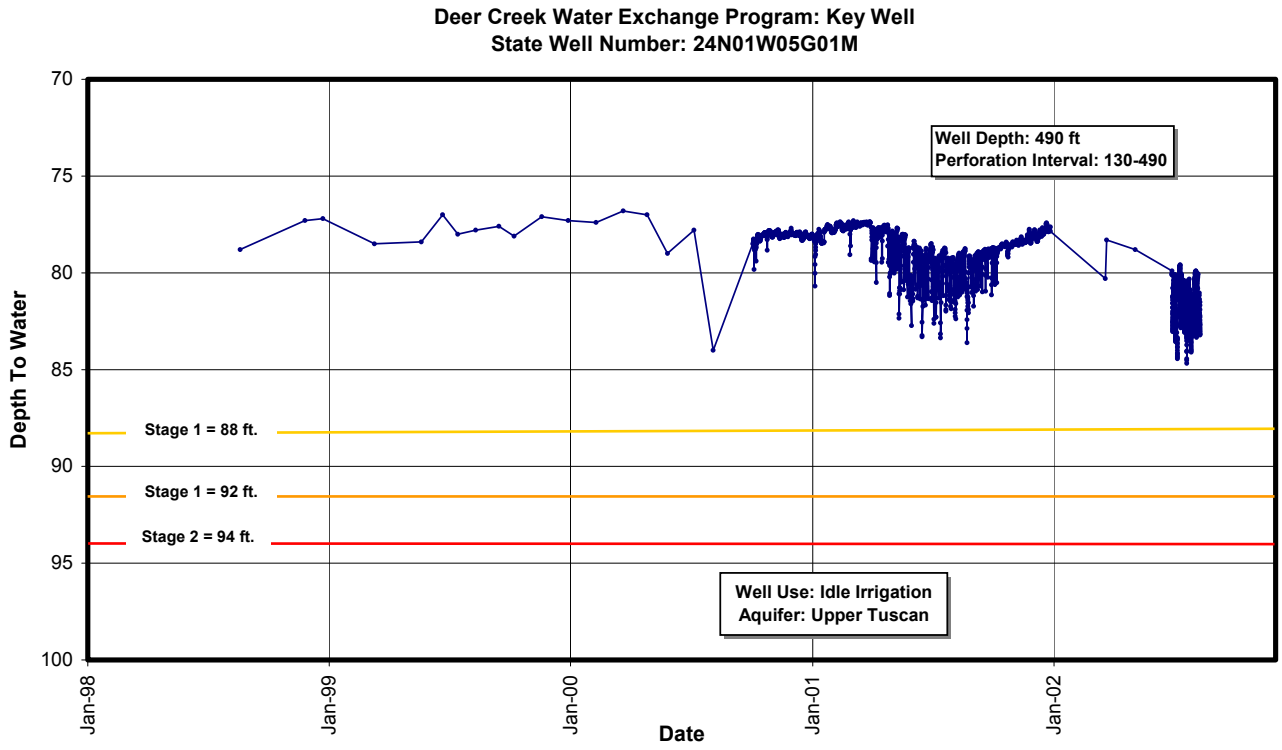

Figure 8. Groundwater Level Stages for Key Well: 24N/01W-05G01

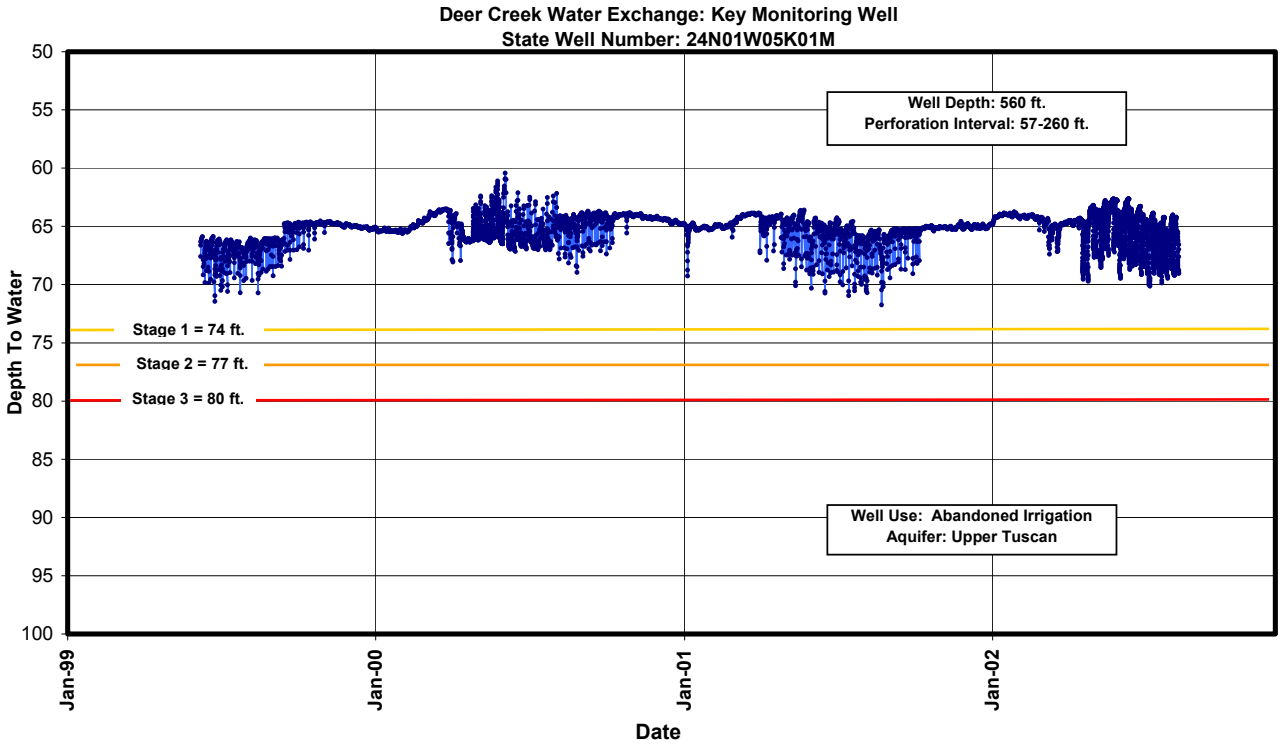

Figure 9. Groundwater Level Stages for Key Well: 24N/01W-05K01

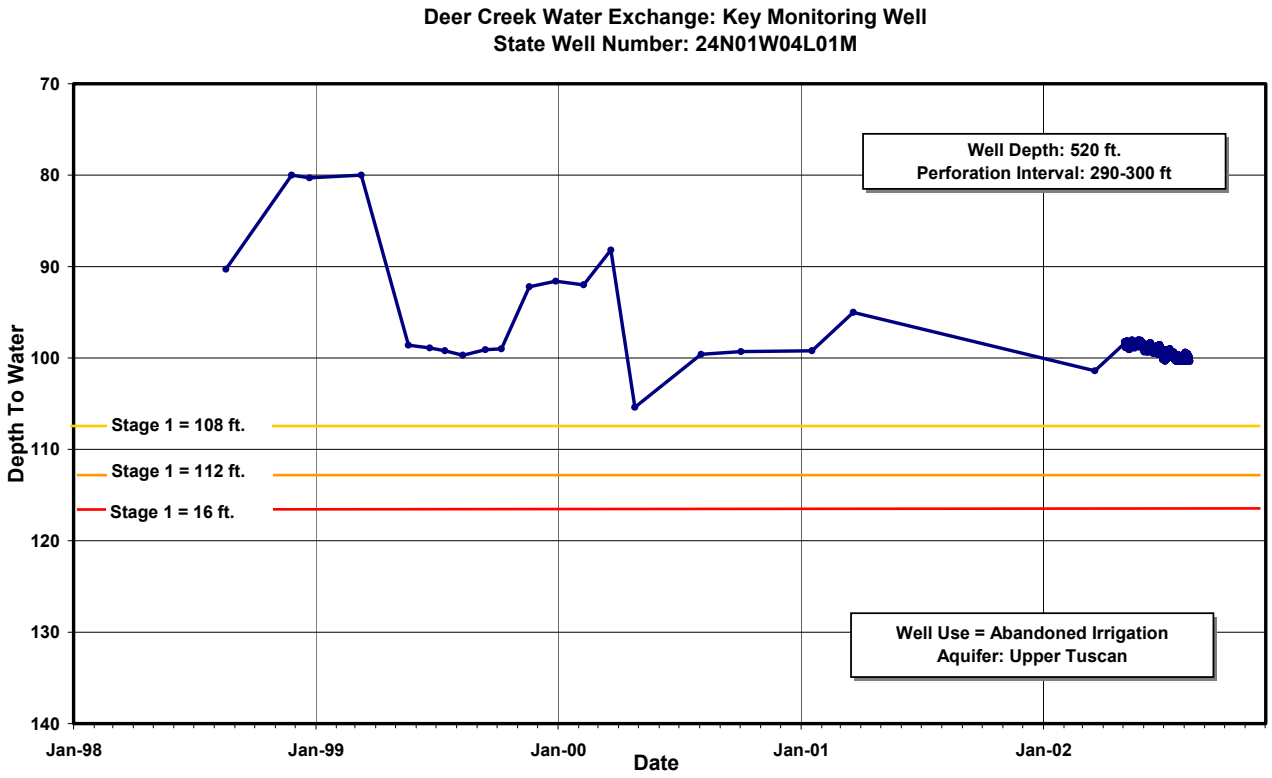

Figure 10. Groundwater Level Stages for Key Well: 24N/01W-04L01

DEER CREEK WATER EXCHANGE PILOT PROGRAM TEHAMA COUNTY PERMIT APPLICATION TO EXTRACT GROUNDWATER FOR OFF PARCEL USE

APPENDIX A; Exhibit B, Attachment 1

Budget Cost Proposal

Budget Cost Proposal

1. During the operation of the pilot program, DWR will reimburse DCID on a monthly basis for expenses directly associated with DCID's efforts to administer the pilot program. Reimbursement of DCID's administrative costs shall not exceed $35,000 during the term of the pilot program unless there is written approval by DWR. Reimbursable expense shall include, but not be limited to:

   a) Ditch tender expenses associated with monitoring the pilot program pump operations and discharge volume, pump servicing maintenance, and routing of pump discharge

   b) Staff time and legal services needed to coordinate with local, county and State representatives, attend pilot program related meetings, develop CEQA documentation and review pilot program related reports; and

   c) Other approved expenses associated with pilot program related services

2. DCID's administrative expenses associated with the pilot program operations will be paid by DWR upon approval of DWR's pilot program manager.

DEER CREEK WATER EXCHANGE PILOT PROGRAM TEHAMA COUNTY PERMIT APPLICATION TO EXTRACT GROUNDWATER FOR OFF PARCEL USE

APPENDIX B:

Notice of Exemption

October 21, 2002

Ms. Mary Alice George
Tehama County Clerk/Recorder
PO Box 250
Red Bluff CA, 96080

Dear Ms. George:

Enclosed is a Notice of Exemption for the Deer Creek Water Exchange Pilot Program-Production Well Installation Project

The project involves the installation of a groundwater production well by the Deer Creek Irrigation District in cooperation with the California Department of Water Resources and the California Department of Fish and Game. This well is part of a pilot project to test the effectiveness of providing increased flow in Deer Creek, by allowing groundwater to be used in-lieu of bypassed surface water. Additional flows within Deer Creek will aide in the recovery of State and federally listed species including Chinook salmon and steelhead.

If you have any questions or need additional information, you may contact me at (530) 839-2365.

Sincerely,

John Edson, President
Deer Creek Irrigation District

Enclosure

October 21, 2002

Office of Planning and Research
1400 Tenth Street, Room 121
Post Office Box 3044
Sacramento, California 95812-3044

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Sincerely,

John Edson, President
Deer Creek Irrigation District

Enclosure

NOTICE OF EXEMPTION

To: Office of Planning and Research
1400 Tenth Street, Room 121
Post Office Box 3044
Sacramento, California 95812-3044

Ms. Mary Alice George
Tehama County Clerk/Recorder
PO Box 250
Red Bluff CA, 96080

From: Deer Creek Irrigation District

Project Title: Deer Creek Water Exchange Pilot Program-Production Well Installation Project

Project Location: Tehama County (see attached figures 1 and 2)

Project Location: Specific locations include;
Pete Wells Site - T 24N, R 1W, Section 4, NW 1/4 of SW 1/4

Description of Nature, Purpose, and Beneficiaries of Project:

The proposed project will involve the drilling of one 900-foot deep test-production well. The production well will be drilled using a large truck-mounted reverse rotary drilling rig equipped with a mud pump, pipe rack, and drilling fluid holding tank/shaker system. Drilling, construction and testing will occur during October and November. Installation of pump, motor, and electric power would occur during November, December and January. Well drilling would occur 24 hours a day, seven days per week. Additional support vehicles including a water tender, front-end loader, pipe truck, and pickup trucks will be parked on-site. The drilling rig and associated equipment will occupy an area of approximately 100 feet by 100 feet. Access for these vehicles will be directly off the adjacent paved and gravel roads. No improvements for site access will be required. Drill cuttings and inert bentonite clay, produced during drilling operations, will be spread over the site upon well completion. The surface completion will consist of an 8 by 10 feet concrete pad, pump-house enclosure and 16 inch discharge pipe. The discharge pipe will be routed underground from the drill site on the east side of Reed Orchard Road to the Deer Creek Irrigation District ditch located along the west side of Reed Orchard Road.

Potential site impacts include minor disturbance of the ground surface within and adjacent to the drill location and a temporary increase in noise levels during drilling and installation of the well. The closest residence is located approximately 2000 feet away. A network of groundwater monitoring wells has been established to detect any groundwater impacts associated with well pumping.

The proposed drilling location is in an area of annual grassland on private property. The physical topography is flat (i.e. <2 percent slope). Field surveys for State and federally "listed" plant and animal species, jurisdictional wetlands, and archaeological resources were completed at the proposed drill location, with no unavoidable adverse impacts identified. No vernal pools occur at or near the proposed drill location. No mature trees will be removed. A small wetland occurs in the corner of the field to the north of the proposed location. However, a raised roadbed through the field occurs between the project area and the wetland. This and additional best management practices will prevent accidental spilling and/or runoff of fluids into the existing wetland.

The primary purpose of the project is to test the effectiveness and feasibility of groundwater exchange within the Deer Creek Irrigation District. Additional goals of the proposed project include collection of basic data on groundwater level fluctuations, monitoring changes in groundwater quality, and geologic exploration. Project beneficiaries include Deer Creek Irrigation District, Tehama County, California Department of Water Resources, California Department of Fish and Game, public trust resources including Chinook salmon and steelhead.

Name of Public Agency Approving Project: Deer Creek Irrigation District

Name of Person or Agency Carrying Out Project: Deer Creek Irrigation District

Exempt Status: Categorical exemption for basic data collection (Section 15306). Categorical exemption for minor alteration of land (Section 15304), Categorical exemption for new construction of limited small new facilities (Section 15303).

Reasons Why the Project Is Exempt:

- Section 15306 - basic data collection, research, experimental management, and resource evaluation activities, which do not result in a serious or major disturbance to an environmental resource.

- Categorical exemption for new construction of limited small new facilities; installation of small new equipment and facilities in small structures; and conversion of the use of small existing structures (Section 15303). This categorical exemption applies to the construction or conversion and location of limited numbers of new small facilities or structures.

- Categorical exemption for minor alteration in the condition of land, such as grading, gardening, and landscaping (Section 15304). Section 15304 applies to minor public or private alterations in the condition of land, water, or vegetation that do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes. This exemption includes grading on land with a slope of less than ten percent.

Contact Person: John Edson, President
Deer Creek Irrigation District

Signature:_____

Date Received for Filing at OPR_____

Figure 1. Project Location Map

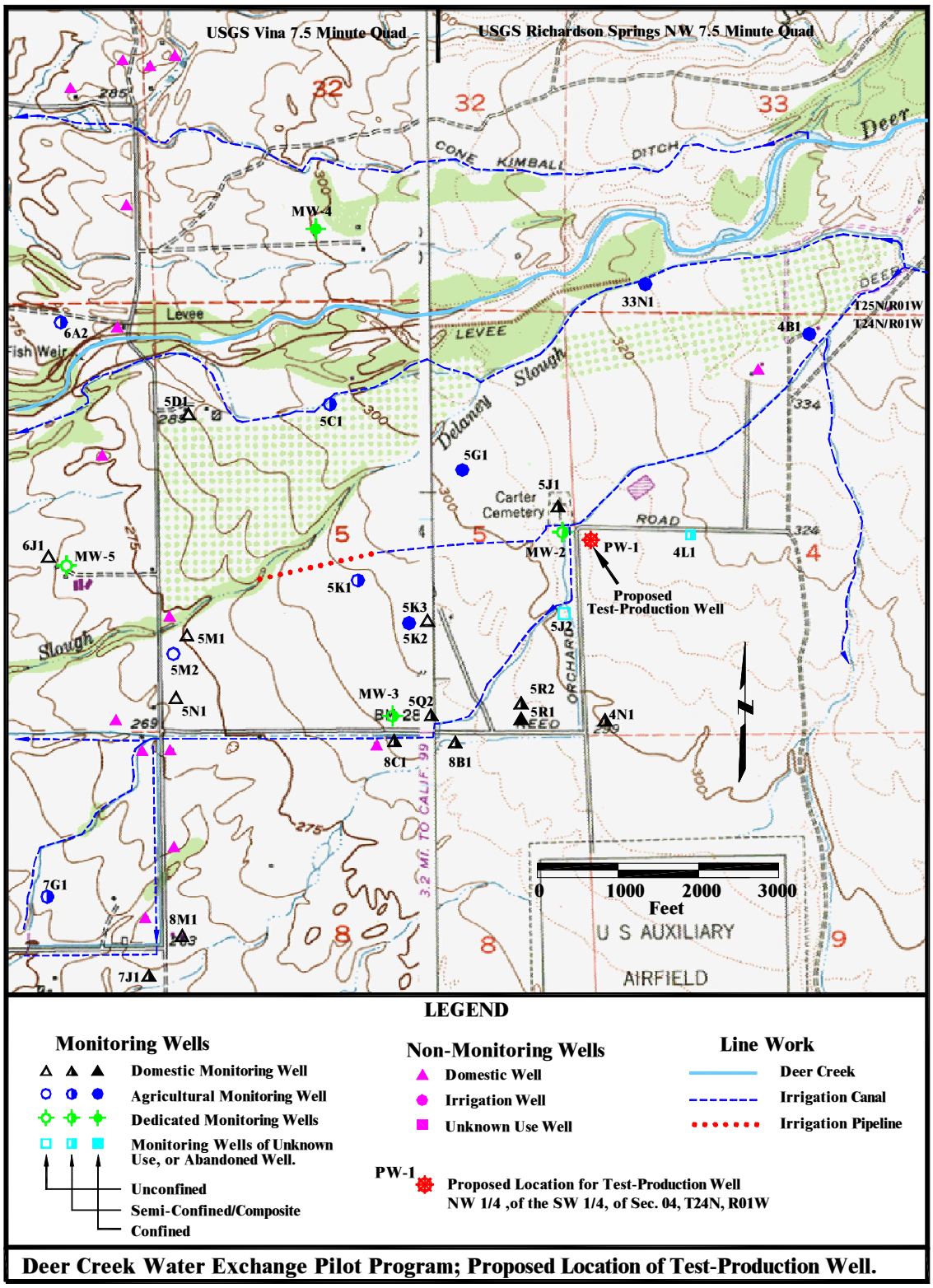

Figure 2. Test-Production Well Site Location Map